PRODUCTION IN THE MODERN ORDER

INDUSTRIAL SOCIETY

PART II

BY

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PREFACE

Technically, this is a revised and enlarged edition of *Industrial Society;* really, it is a new publication both by virtue of large amounts of new material and by virtue of great changes in plan and arrangement.

My purpose has been to provide for the introductory course in economics effective readings that will correlate well with the rapidly expanding social study subject matter now presented in our secondary schools; will serve the common needs of the liberal arts student and the student of the collegiate school of business; and will keep the student ever conscious that our economic order is not a separate and distinct entity but rather a special aspect of our general cultural scheme.

It follows from this statement of purpose that the main field of usefulness of the work is that of the junior college and the first two years of the four-year college. It also follows that it could be used—and indeed has been used—as a survey introductory to the field of the social sciences, being of course a survey organized from the economic point of view.

As originally planned the work was thought of as made up of four parts: Part I, "The Emergence of the Modern Order"; Part II, "Production in the Modern Order"; Part III, "The Co-ordination of Specialists"; Part IV, "Social Control of Economic Activity." In view of limitations of space and also in view of the large amount of material that current texts devote to "economic problems," which are largely problems of social control, it was finally decided not to have a separate formal part on social control but to utilize a considerable amount of social control material in connection with the other three parts.

Instructors who wish to shape their instruction according to the plan and arrangement of this material will find helpful a syllabus entitled, *Outlines of the Economic Order* (published by the University of Chicago Press).

In its final form the entire body of the material should prove useful for the more extended elementary courses, the older and briefer

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PART II

PRODUCTION IN THE MODERN ORDER

PRODUCTION IN THE MODERN ORDER

CHAPTER
I. The Types and Forms of Production
II. The Natural Background of Production
III. The Non-Physical Cultural Background
IV. Modern Capital Goods Exemplified by Power and the Machine
V. The Personal Factor in Production: Labor
VI. The Personal Factor in Production: Enterprise and Management
VII. Some Significant Developments of Modern Production

PURPOSES OF PART II

1. To survey the modern economic order from the point of view of production.
2. To see our producing activities as a co-ordinated whole and as an aspect of the entire cultural scheme.
3. To understand the essential factors, essential costs, and essential limitations involved in making available economic goods.
4. To prepare the way for an evaluation of the effectiveness of the existing producing mechanism.

CHAPTER I

THE TYPES AND FORMS OF PRODUCTION

Purposes of this chapter:

1. To get a working classification of producing activities as a tool for thinking.
2. To get a bird's-eye view of the producing system at work.

Economic goods, both physical goods and services, are "scarce," and the outstanding method which man uses to cope with this condition of scarcity is that of producing economic goods. But what does it mean to produce economic goods? The answer may be a varying answer, depending upon the point of view taken.

One answer may be given by classifying the businesses and personal services which one sees being carried on in society. Approaching the problem from this point of view, Professor Carver has formulated the following diagram:

- Modern production: industries and services
  - Primary industries
    - Extractive
      - Hunting
      - Fishing
      - Grazing
      - Lumbering
      - Mining
    - Genetic
      - Agriculture
        - Tillage
        - Plant breeding
        - Animal breeding
      - Forestry
      - Fish culture
  - Secondary industries
    - Manufacturing
    - Transporting
    - Storing
    - Merchandising
  - Personal and professional services
    - Healing
    - Teaching
    - Inspiring
    - Governing
    - Amusing, etc.

Another answer may be given from the point of view of the utilities created or conferred by the various activities mentioned in the foregoing diagram. These utilities are: form utilities, place utilities,

time utilities, possession utilities, and service utilities. The creation of form utilities is well illustrated in the making of a chair, the raising of grain, or the smelting of ore. The essential point is of course the fact that physical matter is changed from one form to another. The creation of place utilities is illustrated by the work of a transportation system. Time utilities are created by the storage of goods; possession utilities, by the processes connected with transfer of the rights of possession and use. A real estate broker is engaged in the creation of possession utilities in our private property society. Service utilities are those which consist in some personal service rendered.

From the foregoing it is clear that to the economist the term production includes any activity that contributes to making available for our use economic goods—both physical goods and services.

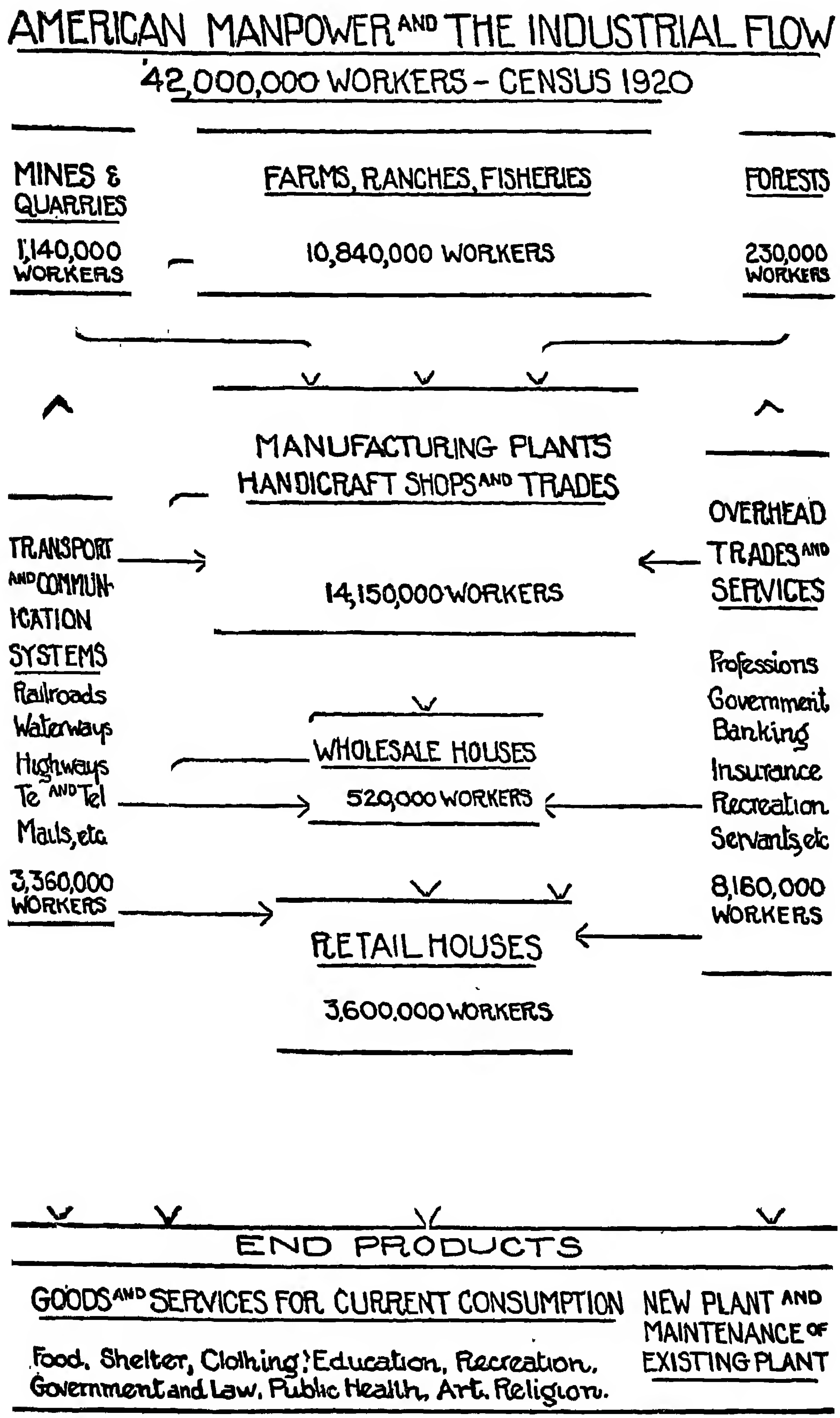
And what are the instruments or agents or factors of production? There is, of course, no one single correct classification of the factors of production. In this case, as always, the classification which one adopts depends upon the purpose he has in mind—upon the use which he expects to make of the classification. The classification that has become orthodox in economic literature speaks of (1) land, (2) labor, (3) capital, and (sometimes) (4) organization or management, but the belief is growing that this classification is not as useful as it was once thought to be. In the chapters which follow we shall deal with (1) nature's contribution or the natural background of production (chap. ii); (2) the cultural background of production as revealed in our non-material culture (chap. iii) and in our material culture (chap. iv); and (3) the personal element in production as manifested in what we call labor (chap. v) and in enterprise and management (chap. vi).

The selections of the present chapter may advantageously be read with the following issues[1] in mind:

1. Descriptively speaking, in what kinds of occupations do we busy ourselves today?
2. What classes of enterprises do we find in our society and what classes of economic goods do they yield?
3. What is the scale of our economic activities today, and to what extent have they become international in character?

[1] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 49–50. (University of Chicago Press.)

1. DIAGRAM OF THE PRODUCING MECHANISM[1a]



[1a] From Chase, *The Tragedy of Waste*, p. 22. By permission of The Macmillan Company, publishers.

2. A CLASSIFICATION OF PRODUCTIVE AND UNPRODUCTIVE ACTIVITIES[2]

I. Productive Industry

1. *Producers of form utility*
   Extractive industries—mining, lumbering, fishing, etc.
   Genetic industries—agriculture, stock-breeding, forestration, etc.
   Manufactures—iron and steel, textiles, automobiles, food products, etc.
2. *Producers of place utility*
   Transportation—railways, canals, ocean transportation, etc.
   Arbitraging—in produce, stocks, bonds, and foreign drafts
3. *Producers of possession utility*
   Merchandizing—wholesale and retail trading
   Banking
   Advertising and salesmanship—of the educative and informative sort
4. *Producers of time utility*
   Storage industries—cold storage, grain elevators, warehousing, etc.
   Speculation
5. *Producers of service utility*
   Professional and personal service—law, ministry, teaching, domestic service, etc.
   Government—police, courts, legislation, administration, etc.
   Insurance

II. Unproductive Activities

1. *Competitive advertising*
2. *Illegitimate speculation*—stock gambling, land speculation, etc.
3. *Predatory activities*—burglary, swindling, adulteration, monopoly, etc.
4. *Aggressive warfare*

See also page 271 for a classification of modern industries and services in terms of (*a*) primary industries, (*b*) secondary industries, and (*c*) professional and personal services. See also page 40 for a diagram of the producing mechanism.

3. CENSUS CLASSIFICATION OF OCCUPATIONS

The following schemes of classification, from the *Index to Occupations*[3] issued by the United States Bureau of the Census, indicate

[2] Reprinted from *Principles of Economics* by R. T. Bye (pp. 84–85) by and with permission of and special arrangement with Alfred A. Knopf, Inc., authorized publishers.

[3] From the *Classified Index to Occupations*, Thirteenth Census of the United States (1910), pp. vi–viii.

the method of classification which was adopted for the Census of 1910.

(A) EXTRACTIVE INDUSTRIES

I. AGRICULTURE, FORESTRY, AND ANIMAL HUSBANDRY

II. EXTRACTION OF MINERALS:

a) *Mining:* coal mines, copper mines, gold and silver mines, iron mines, lead and zinc mines, other mines, mine workers (mine, not specified)

b) *Quarrying:* Quarries (stone, cement, sand, clay, etc.)

c) *Production of salt, oil, and natural gas:* production of salt, production of oil and natural gas

(B) INDUSTRIES OF TRANSFORMATION, TRANSPORTATION, AND TRADE

III. MANUFACTURING AND MECHANICAL INDUSTRIES:

a) *Building trades* (listed as building and hand trades under miscellaneous industries)

b) *Chemicals and allied products:* fertilizer makers; paint makers; powder, cartridge, dynamite, fuse, and fireworks makers; soap makers; other chemical workers

c) *Clay, glass, and stone products:* brickmakers; potteries; tile makers; glass; terra-cotta workers; lime, cement, and gypsum; marble and stone cutters

d) *Clothing:* clothing makers (suits, coats, cloaks, and overalls); clothing makers (other than suits, coats, cloaks, and overalls); corset makers; glove makers; hat makers (wool or felt); shirt, collar, and cuff makers

e) *Food and kindred products:* bakeries; butter and cheese makers; candy; fish curers and packers; flour and grain mills; fruit and vegetable canners, picklers, and preservers; slaughter and packing houses; sugar makers and refiners; other food preparers

f) *Iron and steel and their products:* agricultural implements; automobile factories; car and railroad shops; foundries and metal working; iron and steel mills; ship and boat building; wagons and carriages; other iron and steel workers

g) *Leather and its finished products:* harness and saddle makers and repairers; leather-belt, leather-case, and pocketbook makers; shoes; tanneries; trunk makers

h) *Liquors and beverages:* breweries; distilleries; other liquor and beverage workers

i) *Lumber and its remanufacture:* box makers (wood); furniture; pianos and organs; saw and planing mills; other woodworkers

j) *Metals and metal products except iron and steel:* brass mills; clock factories; copper factories; gold and silver workers; jewelry factories;

lead and zinc factories; tin-plate factories; tinware factories; watch factories; other metal workers

k) *Paper:* box makers (paper); makers of blank books, envelopes, tags, paper bags, etc.; paper mills; pulp mills

l) *Printing and bookbinding:* printing and publishing establishments

m) *Textiles:* carpet mills; cotton mills; dyeing and finishing textiles; hemp and jute mills; knitting mills; lace and embroidery makers; linen mills; print works; rope and cordage factories; sail, awning, and tent makers; silk mills; woolen mills; worsted mills; not specified textile workers

n) *Miscellaneous industries:* broom and brush makers; button makers; charcoal and coke burners; cigars; electric light and power companies; electrical supplies; gas works; oil works; rubber factories; straw workers; tobacco; turpentine distillers; building and hand trades; other miscellaneous industries and occupations; workers in "not specified" manufacturing and mechanical industries

IV. Transportation:

a) *Water transportation:* water transportation

b) *Road, street, and bridge transportation:* construction and maintenance of streets, roads, sewers, and bridges; livery stables; truck, transfer, cab, and hack companies; street railways

c) *Transportation by railroad:* transportation by railroad

d) *Express companies:* express companies

e) *Post, telegraph, and telephone:* post; telegraph and telephone

f) *Other persons in transportation:* other persons in transportation

V. Trade:

Banking and brokerage; insurance; real estate; wholesale and retail trade; elevators; stock yards; warehouses and cold-storage plants; other persons in trade; clerical assistants

(c) SERVICE

VI. Public Service (Not Elsewhere Classified):

a) *Public administration:* federal officials and employees; state officials and employees; county officials and employees; city or town officials and employees

b) *Public defense and maintenance of law and order:*
National defense; army, navy
Maintenance of law and order; United States marshals, county sheriffs, city marshals, constables, detectives, guards in parks, prisons, public institutions, and public buildings, policemen, probation and truant officers, watchmen

VII. Professional Service:

Actors, professional showmen, etc.; artists, sculptors, and teachers of art; clergymen, officials of lodges, religious and charity workers, etc.; legal pro-

fessions; literary professions; medical professions; musicians and teachers of music; scientific professions; teachers, professors in colleges, etc.

VIII. Domestic and Personal Service:

Occupations not in industries; laundries and laundry work

4. ESTIMATED NATIONAL WEALTH OF THE UNITED STATES

(by Classes of Property, 1900 to 1922)[4]

(Note.—Estimates of national wealth for the earlier censuses were not made by precisely the same methods used more recently and are not closely comparable. Changes in buying power of money, as indicated by levels of prices and wages, materially affect the comparisons.)

(All figures in millions of dollars)

Form of Wealth	1900	1904	1912	1922
Grand total	88,517	107,104	186,300‡	320,804
Real estate, plant, and equipment total	69,848	83,801	141,700	229,406
Real property taxed	46,325	55,510	96,923‡	155,909
Real property exempt	6,213	6,831	12,314	20,506
Livestock	3,306	4,074	6,238	5,807
Farm implements and machinery	750	845	1,368	2,605
Gold and silver coin and bullion	1,677	1,999	2,617	4,278
Manufacturing machinery, tools, etc.	2,541	3,298	6,091	15,783
Railroads and their equipment	9,036	11,245	16,149	19,951
Motor vehicles	....	....	....	4,567
Transportation and transmission enterprises (except railroads) total	3,495	4,841	10,265	15,414
Street railways	1,576	2,220	4,597	4,878
Telegraph systems	212	227	223	204
Telephone systems	400	586	1,081	1,746
Pullman and other private cars not owned by railroads	99	123	123	545
Pipe lines	....	....	....	500
Shipping and canals	538	846	1,491*	2,951†
Irrigation enterprises	....	....	361	....
Privately owned waterworks	268	275	290	361
Privately owned central electric light and power stations	403	563	2,099	4,229
All other, total	15,174	18,462	34,334	75,984
Agricultural products	1,455	1,899	5,240	5,466
Manufactured products	6,087	7,409	14,694	28,423
Imported merchandise	425	496	827	1,549
Mining products	327	408	816	730
Clothing and personal ornaments	2,000	2,500	4,295	39,816
Furniture, carriages, etc.	4,880	5,750	8,463	

* Includes $402,000,000 value of ships belonging to the United States navy.

† Includes $1,446,000,000 value of ships belonging to the United States navy.

‡ Differs from estimate as published in 1912 because of revision of estimate for taxed real property in Oklahoma.

[4] Adapted from *Statistical Abstract of the United States, 1928*, p. 287. (Washington, D.C.: Government Printing Office.)

5. A VIEW OF SOME OF OUR LEADING INDUSTRIES

A. SIXTEEN GROUPS OF MANUFACTURING INDUSTRIES, 1925[5]

Industry	Number of Establishments	Wage Earners (Average Number)	Wages	Cost of Materials	Value of Products	Value Added by Manufacture	Primary Horse-Power
			Expressed in Thousands of Dollars				
All industries: 1925	187,390	8,384,261	10,729,969	35,935,648	62,713,714	26,778,066	35,772,628
1914	271,822	7,015,136	4,063,210	14,242,415	24,065,766	9,823,351	22,264,343
1. Food and kindred products	48,113	664,760	793,681	7,748,678	10,418,536	2,669,858	3,881,952
2. Textiles and their products	24,433	1,627,141	1,654,013	5,348,050	9,122,858	3,774,808	3,986,136
3. Iron and steel and their products, not including machinery	6,068	851,270	1,284,339	3,734,350	6,461,668	2,727,318	7,518,999
4 Lumber and allied products	21,922	921,145	978,375	1,724,983	3,688,552	1,963,569	3,472,770
5. Leather and its finished products	4,264	315,288	356,246	1,015,123	1,767,581	752,458	413,759
6. Rubber products	498	141,121	190,563	718,840	1,255,414	536,574	656,857
7. Paper, printing, and related industries	26,553	536,766	805,516	1,614,235	4,143,685	2,529,450	3,060,794
8. Chemicals and allied products	8,871	381,075	506,386	4,184,911	6,438,027	2,253,116	2,984,913
9. Stone, clay, and glass products	8,478	353,036	467,012	603,427	1,640,652	1,037,225	2,348,157
10. Metals and metal products, other than iron and steel	6,924	275,292	380,781	1,946,777	2,833,770	886,993	1,158,486
11. Tobacco manufactures	2,623	132,132	111,558	425,769	1,091,001	665,232	42,075
12. Machinery not including transportation equipment	11,807	858,843	1,225,359	1,985,367	5,020,281	3,034,914	2,714,377
3. Musical instruments and phonographs	461	46,980	62,502	98,761	231,687	132,926	97,318
14. Transportation equipment, air, land, and water	2,778	559,578	908,488	3,389,101	5,451,753	2,062,652	1,888,961
15. Railroad repair shops	2,363	457,755	668,192	563,646	1,332,679	769,033	942,248
16. Miscellaneous industries	11,234	262,079	336,958	833,630	1,815,570	981,940	604,826

[5] Adapted from *Statistical Abstract of the United States, 1928,* pp. 752–53. (Washington D.C.: Government Printing Office.)

B. ESTIMATED VALUE OF FARM PRODUCTS OF THE UNITED STATES, 1926[6]

Products	1926	
	Value $000,000	Percentage of total
Total crops	9,266	100.0
Cereals	3,687	39.8
Cotton	1,294	14.0
Flax, fiber and seed	39	0.4
Fruits	666	7.2
Hay and forage	1,490	16.1
Legume seeds	124	1.3
Other seeds, grass, etc.	35	0.4
Sugar crops	119	1.3
Tobacco	245	2.6
Vegetables	1,117	12.1
Farm-forest products	318	3.4
Other crops	132	1.4
Total animal products	7,300	100.0
Animals raised	3,065	42.0
Bee products	12	0.2
Dairy products	2,952	40.3
Poultry products	1,181	16.2
Wool	85	1.2
Other animal products	5	0.1
Deduct crop fed to livestock	3,581	
Net total, all products	12,985	

[6] Adapted from *Statistical Abstract of the United States, 1928,* p. 605. (Washington, D.C.: Government Printing Office.)

C. VALUE OF MINERAL PRODUCTS OF THE UNITED STATES[7]

(Note.—All figures in millions of dollars.)

Yearly average or year	Total	Metallic	Non-Metallic	Un-speci-fied	Year	Total	Metallic	Non-Metallic	Un-speci-fied
1881–1885...	426	191	229	6	1910....	1,988	750	1,238	*
1886–1890...	541	248	292	1	1911....	1,924	681	1,243	*
1891–1895...	592	244	347	1	1912....	2,238	862	1,375	*
1896–1900...	828	366	461	1	1913....	2,434	879	1,554	*
1901–1905...	1,392	578	813	1	1914....	2,111	687	1,424	*
1906–1910...	1,887	769	1,118	*	1915....	2,395	992	1,400	2
1911–1915...	2,220	820	1,399	1	1916....	3,508	1,621	1,884	3
1916–1920...	5,124	1,796	3,322	5	1917....	4,992	2,086	2,900	6
1921–1925...	5,155	1,153	3,998	5	1918....	5,541	2,153	3,381	7
1901........	1,155	493	661	1	1919....	4,596	1,360	3,233	3
1902	1,329	605	722	1	1920....	6,981	1,762	5,214	5
1903........	1,495	589	906	1	1921....	4,139	654	3,482	3
1904........	1,359	501	858	*	1922....	4,647	987	3,656	4
1905........	1,624	703	921	*	1923....	5,987	1,511	4,472	4
1906........	1,901	886	1,015	*	1924....	5,306	1,232	4,068	6
1907........	2,070	904	1,165	*	1925....	5,678	1,380	4,291	6
1908...... ..	1,592	551	1,041	*	1926....	6,213	1,403	4,802	8
1909........	1,887	755	1,132	*	1927....	5,520	1,217	4,294	9

* Less than $500,000.

6. INTERNATIONAL RELATIONSHIPS IN MANUFACTURE[8]

There are five international relationships which may exist among the various activities of combinations which operate both in the United States and in other countries. These are as follows:

1. Manufacture in foreign countries for distribution in the United States.

2. Manufacture in the United States for distribution in foreign countries.

3. Manufacture in foreign countries from raw materials produced in the United States.

4. Manufacture in the United States from raw materials produced in foreign countries.

5. Parallel manufacture in United States and foreign countries.

The concerns which manufacture commodities in the United

[7] Adapted from *Statistical Abstract of the United States, 1928*, p. 705. (Washington, D.C.: Government Printing Office.)

[8] Adapted from Willard L. Thorp, *The Integration of Industrial Operation*, Census Monograph III, pp. 118–22. (Washington, D.C.: Government Printing Office, 1924.)

States and also are active in the production of their raw materials in other countries deserve special mention. Some indication of this type of industrial activity can be obtained from the following examples:

The Hershey Chocolate Co., manufacturers of chocolate, cocoa, and chewing gum, confine their manufacturing activities in this country to Hershey, Pa. In order to obtain the raw materials used, this company has expanded into Cuba, where it operates two sugar mills, 69 square miles of sugar plantations, and the railroads necessary for efficient production.

The International Harvester Co. operates, in Matanzas Province, Cuba, 3,000 acres of fiber plantations, the products of which are used in the company's twine mills in this country.

The United States Rubber Co., through its subsidiary company, the United States Rubber Plantation (Inc.), is said to own 93,000 acres of land in Sumatra, of which 44,227 acres have been cleared and planted with over 5,000,000 rubber trees.

The Anaconda Copper Co. has undertaken extensive operations in Brazil.

A somewhat different development is found in the case of companies operating in the United States and Mexico. The industries here concerned are those of metal mining and of petroleum refining. The Standard Oil Co. of New Jersey, through the Transcont de Petroleo S. A., Mexico, carries on extensive operations in Mexico, although most of its refining is done in the United States.

Another industry is represented in the activities of manufacturers in both Canada and the United States. The International Paper Co., for instance, operates plants in Maine, New Hampshire, Vermont, Massachusetts, and New York, while the greater part of the woodland which it controls is in Canada.

The instances cited above demonstrate at least the existence of activity on the part of American manufacturers in the production of raw materials abroad for use in their American factories. That foreign manufacturers procure much of their material from the United States is also doubtless true, especially commodities such as raw cotton and foodstuffs.

Concerning the operators who are manufacturing similar products in the United States and other countries, no definite information is

available. Here, again, it is necessary to fall back upon single instances as indicative of the possibilities along these lines.

The largest group includes the international transportation companies. Of these the railroads which afford communication between Canada and the United States are perhaps the most important, since little oceanic transportation is done by American enterprises. Necessarily these railroads operate repair shops both in Canada and in the United States, which are classed by the Census Bureau as manufacturing establishments.

Practically all the companies which have been mentioned as falling in the other categories also manufacture similar productions in the United States and foreign countries. The Singer Manufacturing Co. operates plants outside the United States in St. Johns, Quebec; Kilbowie, near Glasgow, Scotland; Wittenberg, Prussia; and Podolsk, Russia. The Standard Oil Co. of New Jersey, in addition to operating distributing companies (which in many cases includes the operation of tank steamers) in Holland, France, Mexico, Denmark, Germany, Canada, Rumania, and Italy, operates manufacturing companies in Mexico and Rumania and two small refineries in France. The B. F. Goodrich Co. operates a factory in Colombes (Seine), France, and the United States Rubber Co. operates manufacturing establishments in Canada. The International Harvester Co. shows a broad development, controlling companies which own plants and conduct business in the United States, Canada, France, Germany, Russia, and Sweden, and distributing companies in Denmark, Norway, Switzerland, Belgium, Austria, New Zealand, Australia, Great Britain, and the Philippine Islands.

The Ford Motor Co., through affiliated companies, is producing Ford cars in foreign countries. The Ford Motor Co. of Canada (Ltd.), manufacturers at Ford, Ontario; the Ford Motor Co. (England) (Ltd.), has its factory at Manchester; and the Ford Motor Co., Paris, France, has a branch at Bordeaux. There are also assembling and branch plants at Copenhagen, Denmark; Cadiz, Spain; Buenos Aires, Argentina; and Sao Paulo, Brazil.

The American Radiator Co. is another example of such international expansion, with plants and branches at Toronto and Brantford, Ontario; London and Hull, England; Paris and Dole, France; Milan

and Brescia, Italy; Brussels; Berlin, Schoenebeck, and Neuss, Germany; and Vienna and Wiener Neustadt, Austria.

The various international tobacco companies should also be noted. The Tobacco Products Corp. is a combination of various companies having factories and depots in the United States, Canada, Cairo, Smyrna, Athens, Cavalla, Samsoun, and Shanghai. The British-American Tobacco Co. (Ltd.), owns all or a majority of the stock in companies located in Denmark, Belgium, China, India, Ceylon, Egypt, South Africa, Jamaica, Canada, and the United States.

One other development must be mentioned, namely, the growth of international publishing houses. Examples of this kind are the Macmillan Co., which publishes in the United States, Canada, and England; and R. P. Putnam's Sons, Funk & Wagnalls Co., and D. Appleton & Co., publishing in the United States and Great Britain.

These instances should be sufficient to demonstrate the fact that American industry is expanding into foreign countries. It is interesting to note that in most of the cases cited the product is one which has been developed in this country and has then been taken abroad by the company which originally developed it. It is possible that economic enterprises will feel the restraints of national boundaries to a smaller and smaller degree, with the development of rapid communication and of world markets.

See also "Concentration in the International Field," page 877.

7. A CLASSIFICATION OF PRODUCTION ELEMENTS[9]

It will be apparent that in most production processes four elements are needed: the subject element, the thing worked upon; the active agent, the worker; the tools or machines and the like worked with; and the supplies used up. The following classification is based upon a more detailed consideration of the way in which these elements behave in the processes of production:

Man—Human effort.

Land and land betterments.

[9] J. D. Black, *Introduction to Production Economics*, pp. 56–58. (Henry Holt & Co., 1926.)

Land reconstructions—roads, bridges, tunnels, canals, ditches.
Land fixtures—railroads, fences, telegraph lines.
Buildings.
Raw materials—ore, natural timber, fish, game, water, etc.
Goods-in-process.
Supplies—fuel, feed, seeds, oil, paint, paper, twine, etc.
Equipment—tools, machines, street cars, etc.
Work stock—horses, mules, etc.
Breeding stock.
Growing stock.
"Productive" live stock—dairy cows, sheep, etc.
Growing crops.
Organization and goodwill.
Money.

Both buildings and equipment depreciate from their first use, but buildings have a fixed location whereas equipment is movable. Land "reconstructions" such as ditches, tunnels, bridges and roads, depreciate and have fixed location exactly like buildings. Land fixtures behave even more like buildings. Certain other changes to land, however, such as additions of fertilizer, removing stumps or stones, leveling, once they have been incorporated in the land, behave exactly like land itself. There is no significant difference between the behavior of a naturally level stretch of land and one which has been made level artificially; or between natural soil humus and that which has been put there by the use of manures. Land, it will appear presently, although it depreciates with use, does not in ordinary experience ever depreciate to the point where it cannot be restored again to former productivity; and land betterments behave as if they were the land itself—in fact, they are the land itself.

Raw materials appreciate with the first step in production and become goods-in-process, which in turn appreciate and pass into other and more advanced stages of goods-in-process, till they finally become final goods-in-hand for consumption. Appreciation is taking place all the way, although in the case of perishable fruits, for example, accompanied by a depreciation that may more than offset the appreciation. Supplies, on the other hand, are used up in the process of production, either losing their original form completely, as in the case of fuel, or

losing it sufficiently so as not to be suitable for further use, as in the case of paper or twine.

Growing live stock behaves in most respects like goods-in-process; but work stock, breeding stock and "productive" live stock behave like equipment—each act of production uses up some portion of them. All live stock, however, depreciates in an unusual way. In the first place, the organism recuperates almost completely after each act of production, so that the residue of actual final depreciation is always very small; and in the second place, until somewhere near the prime of life is reached, this residue is more than offset by other compensating growth processes, so that it is commonly said that live stock appreciates at first and then depreciates. This statement is actually true, although it must be recognized that the appreciation is after all only a *net appreciation,* the result of a gain of one kind that more than offsets a loss of another kind. The expression "productive live stock" has come into use to describe live stock that yields a product, like milk, wool or eggs. The term is not a good one, however, and continues in use only for the want of a better.

Growing crops is still another form of goods-in-process, very much like growing live stock in most respects.

Money is put in a separate classification because mobility is its very essence. It is like equipment in its method of depreciation, that is, it starts in as new money and wears out from use.

Organization and goodwill are most peculiar of all in their behavior in the production process. Both are very irregular in their manner of appreciating and depreciation.

The behavior of human beings in production is much like that of work stock in one respect, namely, in the manner of appreciating and depreciating. The essential difference between man and all other agents of production are his power to control his own behavior and his ability to determine his own productive powers.

In textbooks in economics, it is customary to group the foregoing list of production elements into three classes. Labor, or Human Effort, is made one classification, Land another, and all the rest are called Capital Goods. Land betterments and land reconstructions are usually classified with Capital Goods because they are products of past effort. Some writers do not attempt to separate Land and Capital

Goods. Obviously such a classification is not of very much value for the purpose of a production economics analysis.

See also "Labor and Natural Objects as Productive Factors," page 297.

8. PRODUCTION ILLUSTRATED BY A COMMODITY[10]

A large part of the world's cotton is grown in the southern part of our own country. This cotton-growing takes place over an enormous territory, and it is performed by some two million growers, who cultivate farms ranging in size from a few acres to great plantations of more than a thousand acres. The product is grown under varying conditions, and of course it varies in quality. It must be brought together, sorted, graded, and sent to mills in Europe, New England, the Middle States, and the South. These mills buy in large quantities, and they must have cotton of a uniform, usable quality. All this constitutes a complex problem.

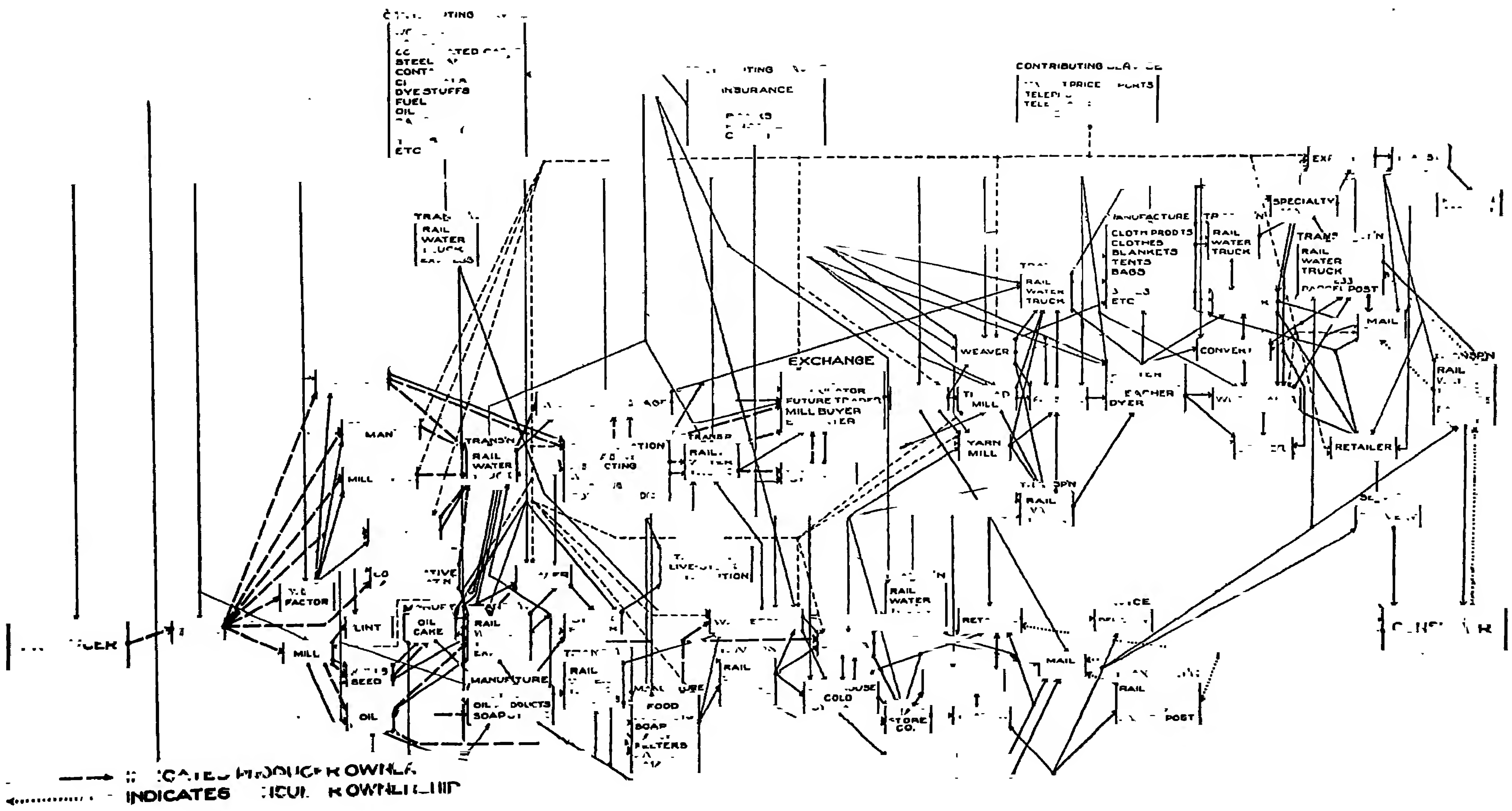
The specialized handling of the cotton seeds.—When the cotton-grower hauls his cotton to the gin, the product is split into two parts—the seeds and the fibers. Let us first follow the seeds through to the consumer. As is hinted in the diagram, the gin leaves a little lint on the seeds. Out of this lint, the hulls, and the meats, our modern technological industry makes a great range of products. The lower part of the chart shows these products emerging at various stages of manufacture; being transported to various places and various persons; being placed in storage; and getting into the hands of jobbers and retailers who finally get them (in one form or another) into the hands of consumers. As is shown by the material at the top of the chart, ranges of contributing services play their part in various stages of the process. The men who perform these services are called "specialist interveners" or "functional middlemen." Truly, a very complex series of operations takes place between the producers and the consumers.

The specialized handling of the cotton fiber.—To go back to the ginnery: The cotton fiber that is pulled off by the little circular saws

[10] Adapted from Marshall and Wiese, *Modern Business*, pp. 227–32. Reprinted by permission of The Macmillan Company, publishers.

DISTRIBUTION OF COTTON AND COTTON PRODUCTS

JOINT COMMISSION OF AGRICULTURAL INQUIRY



of the gin is carried by suction through large pipes to the "press box." Here a mechanical tamper presses the fiber into huge bales of about five hundred pounds each. These are covered with rough bagging and bound with wire bands. The cotton is now for sale. As the chart indicates, this cotton moves on through the market in various channels. The ginner himself may buy it; some country merchant who has been making advances of goods to the grower may take charge of it; "street buyers," working either for themselves or for some big cotton-buyer from New Orleans, Galveston, or Savannah, may buy the cotton from the planter, the ginner, or the country merchant. The grower may hold it for a while or may send it to a commission man at some large market.

Through one agency or another, the cotton begins to pass along various transportation channels to points that are known as concentration points. At these points the big, clumsy bales of the ginnery are put through a compress and packed into smaller and tighter bales, unless that has already been done somewhere else along the way. Here also the cotton is likely to be weighed and inspected and, in particular, it is likely to be graded. This means merely that each bale is judged and that the quality of cotton in it is given a standard name, such as "good middling" or "middling" or "low middling." The grades have been established by our federal government after a very careful study, and agents of the government do the inspecting and assigning of grades. They take samples of cotton from the bales, examine these samples, carefully compare them with samples which the United States Department of Agriculture has furnished, and assign a grade.

The bales are now ready to move either to storage warehouses or to mills in various parts of the world. Most of the further buying and selling of these bales takes place in what is known as the cotton exchanges. These are located at cities such as New Orleans and New York where buying and selling take place. The sellers do not bring the bales to the exchange. All the selling is done either "by samples" taken from the bales or "by description," which means merely that it is sold as being of a certain grade. Anyone who has cotton to sell may offer it for sale in these market places. Anyone who wishes to buy cotton may buy it there. If, however, he is not a member of the exchange,

he must secure the services of someone who is a member in order to carry on these transactions. Buyers and sellers from all over the world buy and sell cotton in these market places through their agents and brokers. The cotton is not owned by the exchange. The exchange is an association of brokers; it is merely a market place in which its members buy and sell. No one needs to use the brokers of these exchanges unless he wishes to do so, but as a matter of fact most of the large transactions in cotton occur on these exchanges.

Such exchanges are convenient not only because they are rooms in which buyers and sellers of cotton can meet; they are also places where financial arrangements, insurance arrangements, and shipping arrangements can be made. Among the members of a cotton exchange will be found commission merchants who sell cotton for planters; exporters who buy cotton for spinners and merchants in Europe; merchants who buy cotton for spinners in the United States; bankers who provide funds for the handling of the cotton; ship agents who represent the vessels by which the cotton is carried abroad and to domestic ports; insurance agents who insure the cotton during its shipment; cotton brokers who bring buyers and sellers together; and future brokers, who buy and sell for delivery in the future.[11] A person dealing in cotton can accordingly find on one floor all the specialists with whom he needs to work.

These exchanges are great information-gatherers concerning facts of importance in the pricing of cotton. Information from all over the world concerning the demand for cotton and the supply of cotton is collected and sent by wire or letter to them. Reports come in continually on the conditions of crops in this and other countries; on existing supplies of cotton; on weather conditions that might affect growing crops; on wars and rumors of wars; in brief, on all possible matters that might affect the demand for cotton or the supply of cotton. The brokers who deal on the exchanges become very expert in judging the effect of these varying conditions upon the price of cotton. The price at which cotton sells at these central markets is telegraphed all over the world. Cotton, even in remote country districts, is bought and sold on the basis of the prices at the exchanges.

The rest of the diagram on page 287 is self-explanatory. The cot-

[11] *Report of the Industrial Commission,* Vol. XI (1901), p. 27.

ton which has been bought and sold on the exchanges moves through various transportation facilities to foreign markets or to mills in our own country and there goes through various types of manufacturing. Brokers, wholesalers, mail-order houses, retailers, play their part, and the goods finally reach the consumer. As was true of the handling of the cotton-seed products, ranges of specialist interveners or functional middlemen give their assistance at various stages of the process. The result of it all is that producers and consumers are knitted together.

See also "Diagram of the Producing Mechanism," page 273.

CHAPTER II

THE NATURAL BACKGROUND OF PRODUCTION

Purposes of this chapter:

1. To get a glimpse of the significance of natural resources in the production of economic goods and services.
2. To see the outstanding problems involved in the effective use of natural resources.

It is a commonplace that without the aid of nature's powers, man can do nothing—and indeed would not exist.

In the earliest stage of his culture, man was a mere collector or appropriator, taking with his bare hands such of nature's yield as she unaided—and unsubjugated—chose to grant him. As we look back at that early stage, it is abundantly plain that in few cases does nature unaided yield goods in the form desired. As time went on, man became increasingly able to take substances furnished by nature and to work them over to his uses as hunting tools, as shelter devices, as clothing, and as not a few other goods. He became an adapter. Fairly recently as human affairs go, man has added to his appropriative and adaptive propensities a quality that may properly be called creative; he now creates substances not found in nature (for example, glass, cement, steel), and he finds that this creative power adds not a little to his ability to live well.

In some real sense all that man does or can do in production is to command—to harness—natural forces and resources. This chapter, accordingly, may well deal with two major issues: What is the rôle played by earth features and earth resources in production? What are the characteristic problems in the effective use of natural resources?

A. Earth Features and Earth Resources Condition Man's Activities

Man's whole life is conditioned by an interaction between man and his natural environment. In the more primitive stages of culture, nature very patently determines the character of man's activities. The character of his housing (witness the Eskimo hut), the devices and

forms of transportation (witness the modes of travel of the Iroquois), the character and abundance of his food supply, the forms of his religion even—and this is the merest beginning of a long list—are visibly and profoundly influenced by his natural environment. In the higher stages of culture we say that man has conquered nature; that he is more "free" from the grip of nature. There is no harm in putting the matter thus, provided we realize that what has really happened is this: man has become more free from the thralls of a *single local* environment; as for the rest, he still depends upon the powers of nature and his activities are still conditioned by those powers. He has, however, become a more active agent in the partnership with nature, and the interactions of the two are now on a different plane.

On every plane of this interaction, the influence of the natural environment is not only persistent and abiding but also powerful. Climate, soil, minerals, topography, flora, fauna, natural forces, and powers—these are relatively unchanging and they set the stage for man's cultural development. They are reflected somewhat in his physical being and also in his speech, his religion, his literature, in all his social and economic institutions.

The following selections point the way to the answer of such issues[1] as these:

1. Precisely what materials, powers, forces, etc., are included in the expression, "earth features and earth resources"?
2. In what types of ways do these earth features and earth resources condition our economic activities?
3. Does the physical environment determine culture?
4. In what fields or types of activity has man achieved outstanding control of nature?
5. What are the main uses which are made of "land" in production?

1. THE PLACE OF NATURAL AGENTS IN PRODUCTION

A. THE DEBT OF MAN TO NATURE[1a]

In this inquiry the earth as modifying human life includes the land surface down to the bottom of the deepest possible mine or artesian

[1] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 53–55. (University of Chicago Press.)

[1a] Adapted from Otis T. Mason, "Technogeography, or the Relation of the Earth to the Industries of Mankind," in the *American Anthropologist*, VII (1894), 138–58.

well or geological stratum; all the aqueous mass—that is, every drop of water in the seas and out of them, for there is no telling when any drop may enter the circle of human agencies and ownerships; the circumambient air, every gallon of that aerial ocean which swathes the world and vitalizes all living things, the common carrier of clouds and birds, of health and disease, of music and perfumes, of industry and commerce. As modifying human conduct, as subject of pre-emption and monopoly, not only the masses just mentioned are included, but motions and powers, even gravity, mechanical properties, physical forces, chemical activities, vital phenomena of plants and animals, that may be covered by patents and their uses become a matter of legislation and diplomacy.

The earth is the mother of all mankind. Out of her came they. Her traits, attributes, characteristics they have so thoroughly inherited and imbibed that, from any doctrinal point of view regarding the origin of the species, the earth may be said to have been created for men and men to have been created out of the earth. By her nurture and tuition they grow up and flourish, and folded in her bosom they sleep the sleep of death.

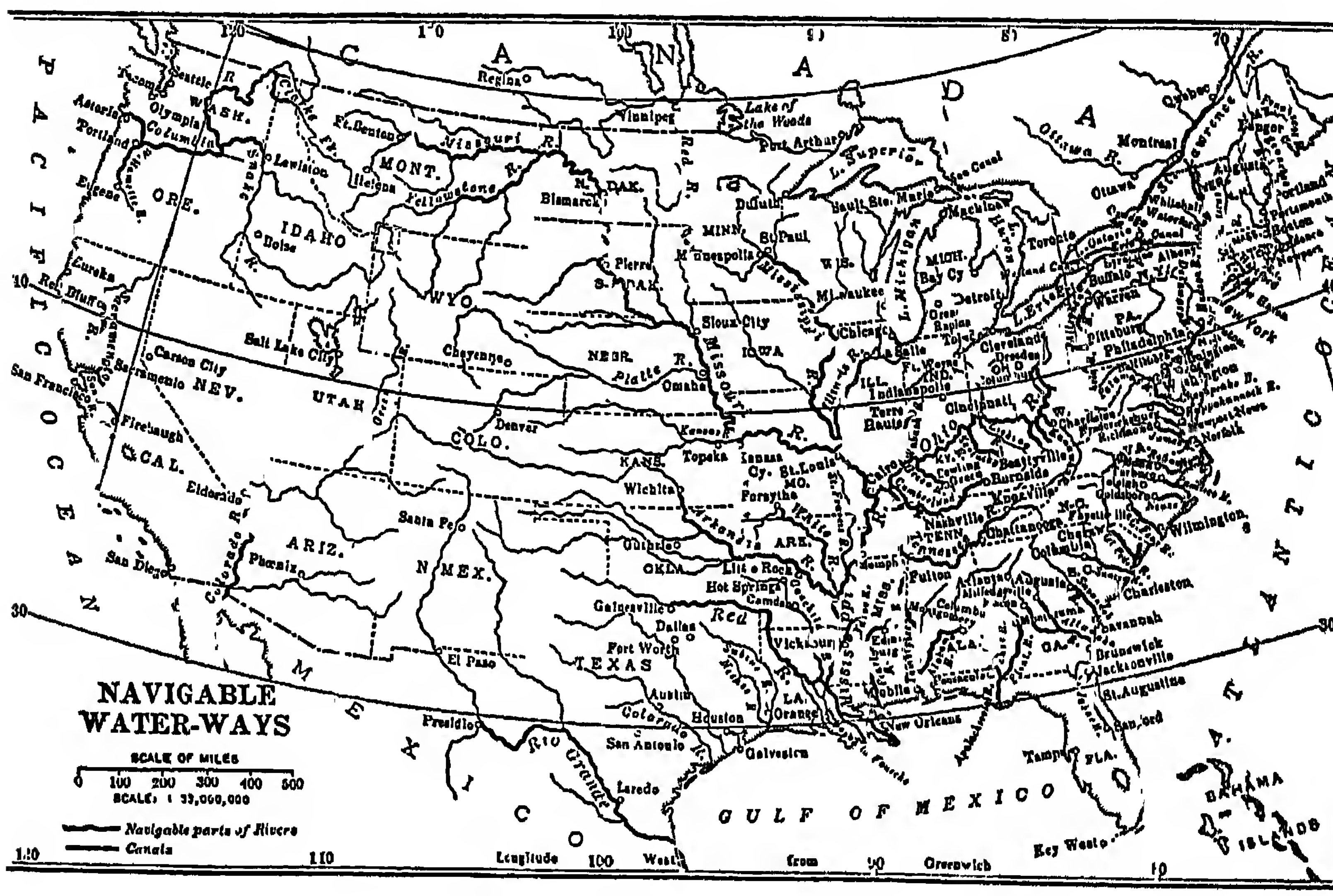
The earth is also a great warehouse of materials of infinite qualifications for gratifying human desires. This is apparent enough to anyone who reflects about it, but few persons think of the long ages during which these substances were being compounded and compacted. These materials are the foundation of all technique and all styles of technique—textile, plastic, graphic, glyphic, tonic, and landscape. For them the earth not only furnishes the raw stuffs, but the apparatus and different motives to different races.

The earth is also the reservoir of all locomotion and power useful to man. Even the strength of his own limbs and back is derived from the food which she bestows. I do not speak of that, however, but of the substitutes therefor. She gives to the North American Indians the dog, to the South American the llama, to the people of the eastern continent the horse, ass, camel, elephant, and ox to convey them about and to carry or draw their loads.

The winds blow upon the sails and turn the mills, the waters set in motion the wheels and transport the freight. The steam is a still more versatile genius of power, and electricity just enters upon its

mission. Coal, as a cheap source of energy, enables men to substitute for areas of raw material areas of manufacture and, indeed, to create areas of consumption.

It would occupy too much space were I to elaborate in the most elementary manner the methods in which domestic animals, wind, fire, water, elasticity of solids, elasticity of gases, explosives, chemical action, magnetism, and electricity had enrolled themselves in the serv-



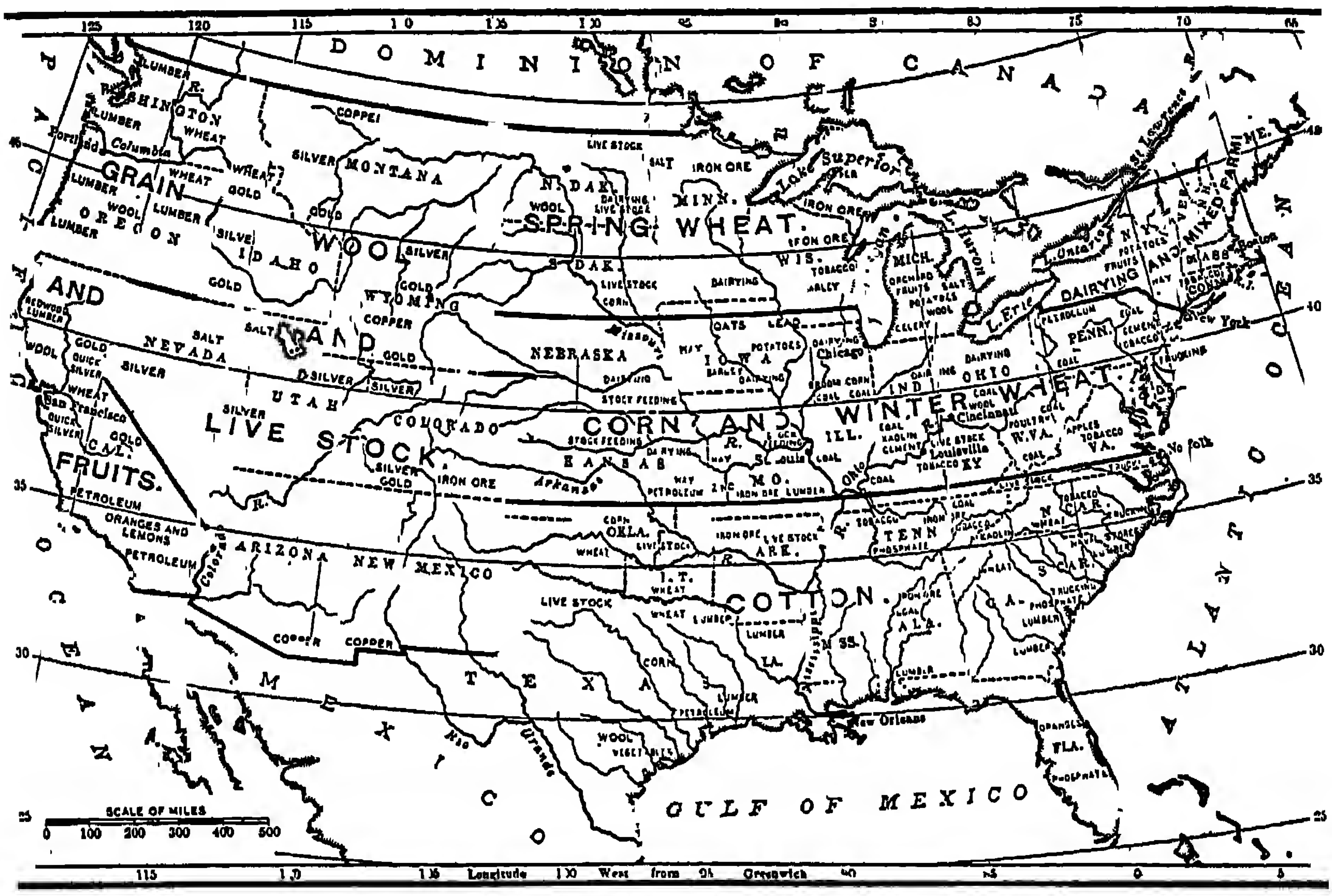
Navigable Waterways

The heavy lines show the navigable waterways of the United States, in which the water is 3 feet deep or over. The length of these is some 18,000 miles.

ice of mankind merely to furnish power to do the work that in the simplest form is done by hand.

The form of the globe, its coast lines, elevations and reliefs, the amount of sunshine, the properties and contents of the atmosphere, the varying temperatures, winds, rainfalls, and springs beneath the surface, the waterfalls in the surface also act as motives, if not as motive power to all apparatus and all the movements of men. We cannot eliminate the heavenly bodies from this enumeration, since they furnished clocks and almanacs and compasses to primitive peoples, and longer voyages were undertaken by their guidance in the Pacific than were made two centuries later in the Atlantic by Columbus with the aid of the mariner's compass.

Exploitation and cultivation, manufacture, transportation, exchange, consumption, together constitute the round through which commodities are conducted in the progress of industries. The earth was in the beginning and is now the teacher of these activities. There were quarriers, miners, lumberers, gleaners, and, some say, planters; there were fishermen, fowlers, trappers, and hunters before there was a *genus homo*. There were also manufacturers in clay, in textiles, and

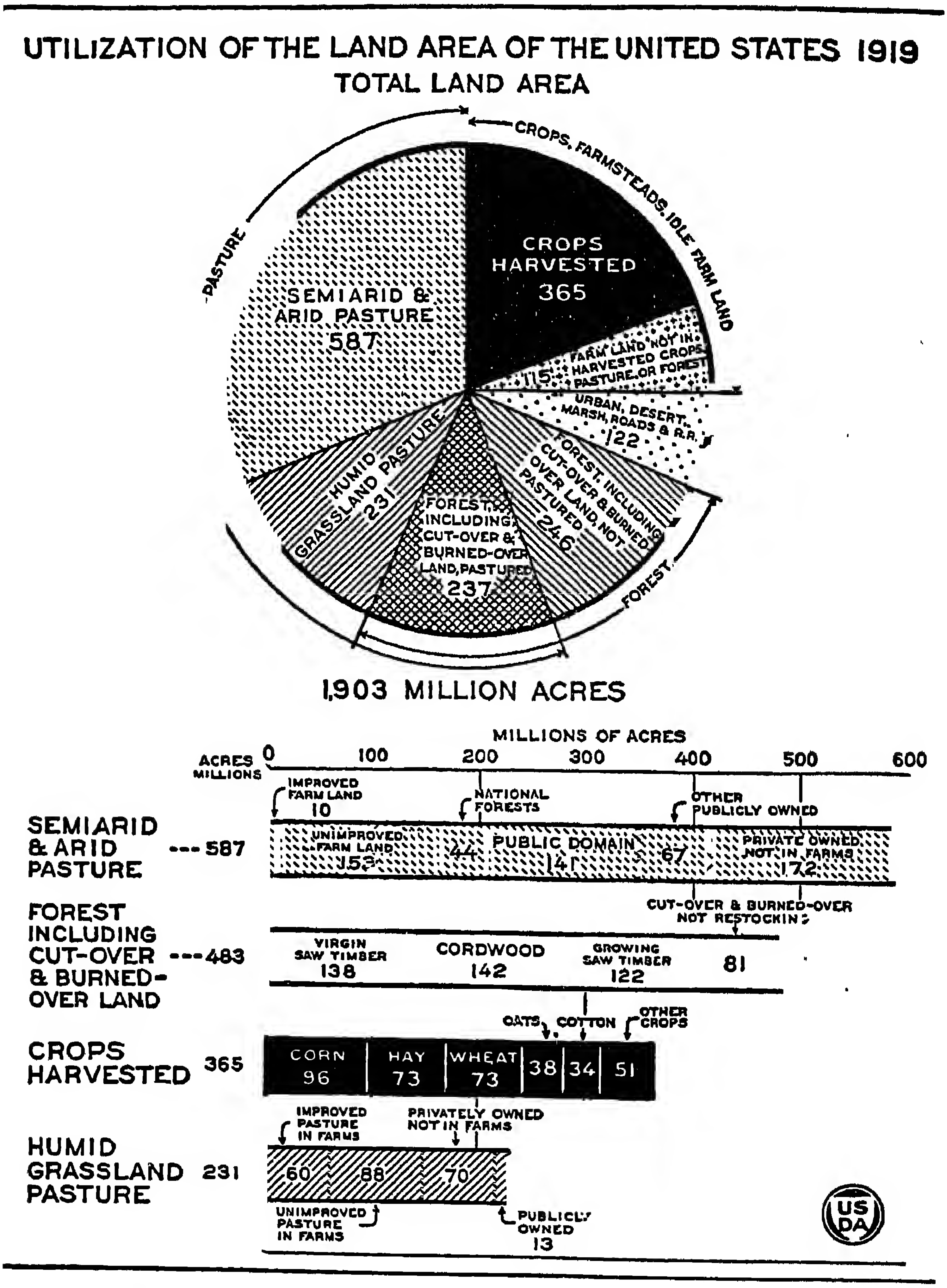


Regional Distribution of Products in the United States

in animal substances before there were potters, weavers, and furriers; there were all sorts of moving material and carrying passengers and engineering of the simplest sort. It might be presumption to hint that there existed a sort of barter, but the exchange of care and food for the honeyed secretion of the body going on between the ants and the aphidae look very much like it.

In all this, the race has grown, not independent of the earth, but more dependent upon it. Artificial and domesticated supplies of material are as much from the earth as the wildest. Men in devising tools and machinery and engines to do the work of their hands have had to go to their mother for them. They use other forces than their own, but they are still forces furnished by the earth. They have multiplied in-

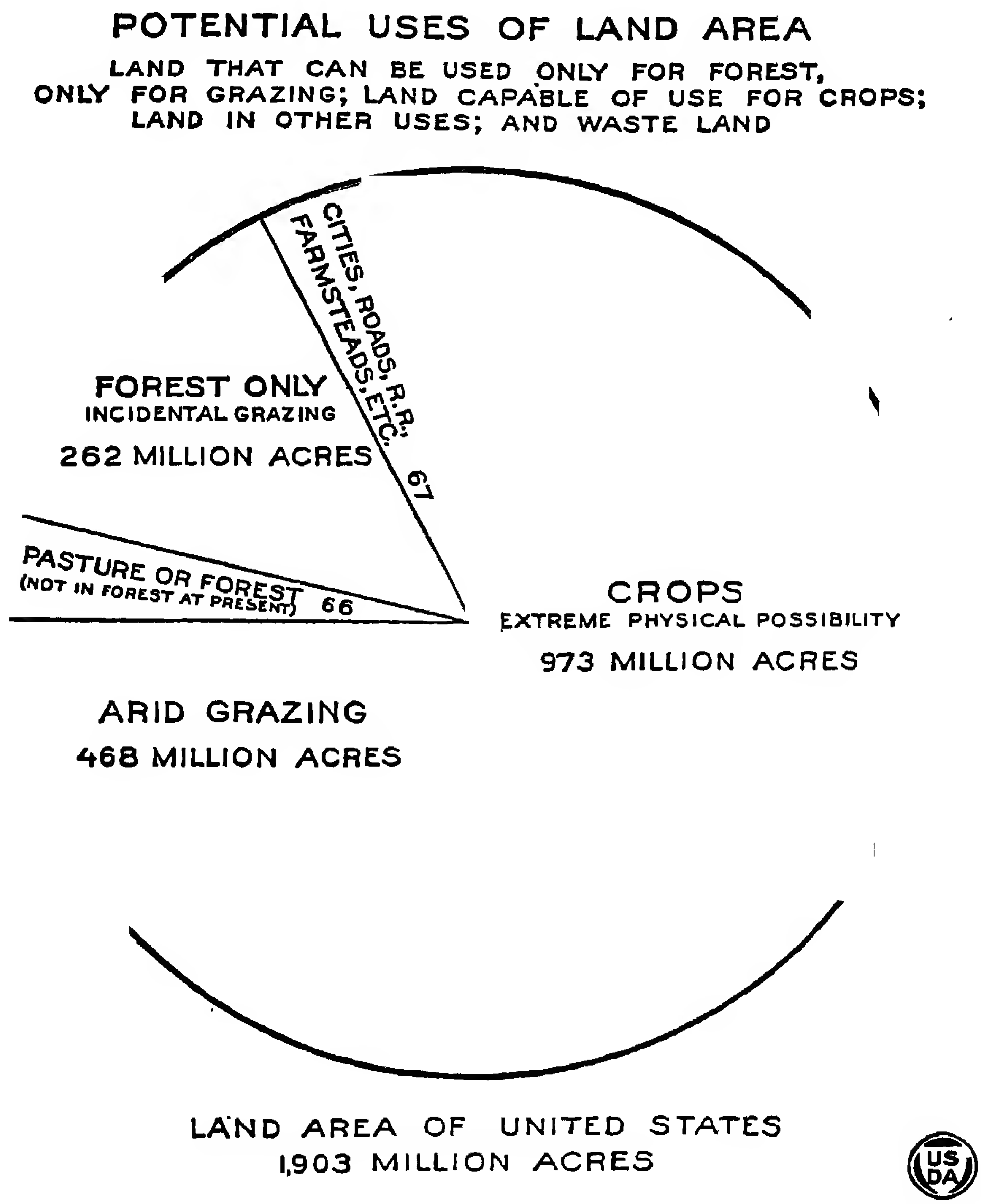
vention upon invention, but every one of them is a device for using a great loan already in hand for the purpose of raising a larger one.



Utilization of Land Area of the United States, 1919

In this partnership between man and the earth the progress of culture has been from naturalism to artificialism; from exploitation to cultivation and domestication; from mere muscular power to more subtle physical force of man, of beast, of water, of air, of fire, of elec-

tricity; from tools to machinery; from simplest imitative processes to highly complex processes, involving many materials and motive pow-



Potential Uses of Land Areas of the United States

ers and inventions; from short journeys to long journeys; from mere barter to world-embracing commerce; from monotonous and monorganic food and clothing, shelter and furniture, mental and social appliances to forms as complex and varied as the imagination can conceive. And when the supply gives out, it is not the earth that fails, but it is the comprehension and the skill of men.

B. LABOR AND NATURAL OBJECTS AS PRODUCTIVE FACTORS[2]

The requisites of production are two: labour, and appropriate natural objects. Labour is either bodily or mental; or, to express the distinction more comprehensively, either muscular or nervous. Of the other requisite—appropriate natural objects—it is to be remarked, that some objects exist or grow up spontaneously, of a kind suited to the supply of human wants. There are caves and hollow trees capable of affording shelter; fruit, roots, wild honey, and other natural products, on which human life can be supported; but even here a considerable quantity of labour is generally required, not for the purpose of creating, but of finding and appropriating them.

Nature, however, does more than supply materials; she also supplies powers. The matter of the globe is not an inert recipient of forms and properties impressed by human hands; it has active energies by which it cooperates with, and may even be used as a substitute for, labour. In the early ages people converted their corn into flour by pounding it between two stones; they next hit on a contrivance which enabled them, by turning a handle, to make one of the stones revolve upon the other; and this process, a little improved, is still the common practice of the East. When the time came at which the labour and sufferings of slaves were thought worth economizing, the greater part of this bodily exertion was rendered unnecessary, by contriving that the upper stone should be made to revolve upon the lower, not by human strength, but by the force of the wind or of falling water. In this case, natural agents, the wind or the gravitation of the water, are made to do a portion of the work previously done by labour.

Cases like this, in which a certain amount of labour has been dispensed with, its work being devolved upon some natural agent, are apt to suggest an erroneous notion of the comparative functions of labour and natural powers; as if, in the case of things made (as the phrase is) by hand, nature only furnished passive materials. This is an illusion. The powers of nature are as actively operative in the one case as in the other. A workman takes a stalk of the flax or hemp plant, splits it into separate fibres, twines together several of these fibres with his

[2] Adapted from J. S. Mill, *Principles of Political Economy*, Book I, chap. i.

fingers, aided by a simple instrument called a spindle; having thus formed a thread, he lays many such threads side by side, and places other similar threads directly across them, so that each passes alternately over and under those which are at right angles to it; this part of the process being facilitated by an instrument called a shuttle. He is said to have done this by hand, no natural force being supposed to have acted in concert with him. But by what force is each step of this operation rendered possible, and the web, when produced, held together? By the tenacity, or force of cohesion, of the fibres: which is one of the forces of nature.

If we examine any other case of what is called the action of man upon nature, we shall find in like manner that the powers of nature, or in other words the properties of matter, do all the work, when once objects are put into the right position. This one operation, of putting things into fit places for being acted upon by their own internal forces, and by those residing in other natural objects, is all that man does, or can do, with matter. He moves a seed into the ground; and the natural forces of vegetation produce in succession a root, a stem, leaves, flowers, and fruit. He moves an axe through a tree, and it falls by the natural force of gravitation; he moves a saw through it, in a particular manner, and the physical properties by which a softer substance gives way before a harder, make it separate into planks, which he arranges in certain positions, with nails driven through them, or adhesive matter between them, and produces a table, or a house. He moves a spark to fuel, and it ignites, and by the force generated in combustion it cooks the food, melts or softens the iron, converts into beer or sugar the malt or cane-juice, which he has previously moved to the spot. He has no other means of acting on matter than by moving it.

Labour, then, in the physical world, is always and solely employed in putting objects in motion; the properties of matter, the laws of nature, do the rest.

Some writers have raised the question, whether nature gives more assistance to labour in one kind of industry or in another; and have said that in some occupations labour does most, in others nature most. In this, however, there seems much confusion of ideas. The part which nature has in any work of man, is indefinite and incommensurable. It is impossible to decide that in any one thing nature does more than in

any other. One cannot even say that labour does less. Less labour may be required; but if that which is required is absolutely indispensable, the result is just as much the produce of labour, as of nature. When two conditions are equally necessary for producing the effect at all, it is unmeaning to say that so much of it is produced by one and so much by the other; it is like attempting to decide which half of a pair of scissors has most to do in the act of cutting; or which of the factors, five and six, contributes most to the production of thirty.

See also "The World's Power Resources," page 329.

2. THE INFLUENCE OF GEOGRAPHICAL ENVIRONMENT

A. CLASSIFICATION OF TYPES OF INFLUENCE[3]

Man can no more be scientifically studied apart from the ground which he tills, or the lands over which he travels, or the seas over which he trades than polar bear or desert cactus can be understood apart from its habitat. Man's relations to his environment are infinitely more numerous and complex than those of the most highly organized plant or animal.

Four fundamental classes of effects of geographical environment can be distinguished.

I. The first class includes direct physical effects of environment, similar to those exerted on plants and animals by their habitat. Certain geographic conditions, more conspicuously those of climate, apply certain stimuli to which man, like the lower animals, responds by an adaption of his organism to his environment. Many physiological peculiarities of man are due to physical effects of environment, which doubtless operated very strongly in the earliest stages of human development, and in those shadowy ages contributed to the differentiation of races.

II. More varied and important are the psychical effects of geographic environment. As direct effects they are doubtless bound up in many physiological modifications; and as influences of climate, they help differentiate peoples and races in point of temperament. They are reflected in man's religion and his literature, in his modes of

[3] Adapted from E. C. Semple, *Influences of Geographic Environment*, pp. 1–2, 33–44. (New York: Henry Holt & Co.; London: Constable & Co., Ltd., 1911.)

thought and figures of speech. The cosmography of every primitive people, their first crude effort in the science of the universe, bears the impress of their habitat. The Eskimo's hell is a place of darkness, storm and intense cold; the Jew's is a place of eternal fire. Buddha, born in the steaming Himalayan piedmont, fighting the lassitude induced by heat and humidity, pictured his heaven as Nirvana, the cessation of all activity and individual life.

To such influences man is a passive subject, especially in the earlier stages of his development; but there are more important influences emanating from his environment which affect him as an active agent, challenge his will by furnishing the motives for its exercise, give purpose to his activities, and determine the direction which they shall take. These mold his mind and character through the media of his economic and social life, and produce effects none the less important because they are secondary.

III. Geographic conditions influence the economic and social development of a people by the abundance, paucity, or general character of the natural resources, by the local ease or difficulty of securing the necessaries of life, and by the possibility of industry and commerce afforded by the environment. From the standpoint of production and exchange, these influences are primarily the subject matter of economic and commercial geography; but since they also permeate national life, determine or modify its social structure, condemn it to the dwarfing effects of national poverty, or open to it the cultural and political possibilities resident in national wealth, they are legitimate material also for anthropo-geography.

IV. The next class includes the effect of natural barriers, like mountains, deserts, swamps, and seas, instructing or deflecting the course of migrating people and in giving direction to national expansion; it considers the tendency of river valleys and treeless plains to facilitate such movements, the power of rivers, lakes, bays and oceans either to block the path or open a highway, according as navigation is in a primitive or advanced stage; and finally the influence of all these natural features in determining the territory which a people is likely to occupy, and the boundaries which shall separate them from their neighbors.

B. TYPES OF ENVIRONMENT AND THEIR RESULTS[4]

The economic geographer of course recognizes that the human activities of a given region are influenced by many factors other than environmental. Racial, religious, historical, social, economic, political, as well as environmental, considerations all enter into the picture. The non-environmental factors at times and places indeed may be the dominating ones in explaining many of the observed economic facts. Race and creed and custom may and do modify the ways in which even such factors of environment as are controlling operate. The geographer's peculiar function, however, is to explain, as far as he may, the differences in the economic life and institutions that exist between regions and to determine the part that environmental forces have exerted—whether their effects be great or small—in producing those differences.

The basic concept on which the work of the geographer rests is this: the natural environment, while not the only factor, is one of the chief molding forces (if not the chief force) in man's economic life. Man is continually adjusting himself to his environment. Since man's economic life rests from its very nature upon securing a living from the earth, the best type of economic life is the one that is best adjusted to the physical environment. This does not imply that it should not also be well adjusted to the social and other conditions of the region. The natural environment, however, sets the stage. It furnishes the scenery. Climate and soil and topography and location are persistent and abiding. To them ultimately adjustments must be made, both in *kind* of development and in the *degree* of development. For a region is not to be measured, geographically nor economically, solely in terms of its resources; but also in terms of its fitness for supporting a people with the energy and initiative necessary to utilize the resources to best advantage.

Not only are physical factors fundamental to economic life; they are of increasing importance as the world develops and economic life becomes more complex. With the increase of world population, crowding on the means of subsistence, and with agriculture becoming more

[4] Adapted from G. R. Roorbach, "Economic Problems Involved in the Payment of International Debts," Round Table Discussions, *American Economic Review*, Supplement, XVI, No. 1 (March, 1926) 121–24.

complex as it becomes more scientific, nicer and finer adjustments of all kinds need to be made if the earth is to yield its maximum of food and raw materials. The best utilization of the land is, in part, a geographic problem. The best utilization of labor and management is also, apparently, in part a geographic problem.

In manufacturing industries the same is true. In the midst of competition, domestic and international, whatever contributes to the efficiencies and economies of manufacturing needs now to be more carefully considered. For example, the geographic location of a plant assumes an importance now that did not obtain when competition was less keen and almost any site would do. Location must be made with greatest care in reference to power, raw materials, markets, and climate. The exact determination of the effects of climate upon the energy and initiative of factory operatives and management was never so much needed as today. A wrong climatic location may overcome all other apparent advantages and lead to industrial failure. The engineer today locates his hydroelectric plant after giving more careful considerations than ever before to topography, to geology, to forest cover, to rainfall, to run-off, to evaporation, and to all the other factors, both physical and economic, that make for success or failure to the enterprise.

If the natural geographic factors are among the controlling forces in the economic life of man, we should expect to find that similar types of environment, under similar stages of development, would show similar types of economic adjustments. Or putting it in another way, from a given combination of environmental conditions the general type and potential characteristics of certain phases of the region's economic life should be indicated. There are many cases that indicate this may be the situation, although much more work must be done in the study of regions before we can speak with greater confidence.

Perhaps one of the best known and simplest illustrations of this is to be seen in the economic life of the so-called Mediterranean type of geographic environment. The Mediterranean region of Southern Europe, as we all well know, is characterized by a climate whose winters are cool and with moderate rainfall, and whose summers are long, hot, and dry. The topography of Mediterranean lands in general is rugged, with intermountain valleys, narrow coast plains and deltas, interior

plateaus and mountains. In response to these conditions, a distinct type of agricultural and pastoral life has developed, remarkably adapted to the climatic and topographic conditions. Winter grains—wheat and barley—that grow in the cool moist winter months and are harvested in the dry spring; drought-resisting tree crops as the vine and the olive; irrigation crops—fruits and alfalfa on the alluvial fans; large areas of lands too dry and too rugged for tilled agriculture utilized for grazing, and grazing especially of the poor land animals—the goat and the donkey. Its industries likewise reflect the environment—dried fruits, especially the raisin, the fig and the date, the prune and the apricot; the fruit and vegetable canning industry; the tourist industry; and the moving picture industry.

It is significant that the other widely separated sections of the earth that possess similar Mediterranean types of environment have developed similar methods of wealth production, even under different racial and social and political and historical backgrounds. Southern California is duplicating in its broad outlines the type of agricultural life found on the shores of the Mediterranean. In detail it differs; but the environment also differs in detail and the region is economically much younger. Differences in other factors, such as location, differences in population density, in racial elements, and so on, account for many of these differences, but they do not destroy the general similarity. Strikingly enough, the same features appear in the Central Valley of Chile, where the same Mediterranean type of environment exists, and also in the Cape Provinces of South Africa, and in the extreme south of Australia. And the more these regions develop the more closely do they come to the common type. The geographic type is distinct: the economic type is likewise distinct and is responding in similar ways to the similar geographic facts. We can speak safely of a "Mediterranean type of agricultural life." Clearly its basis rests on the physical facts of geography.

Nor is this illustration unique. Taking another type of environment as illustrated by the cool wet summers and mild but raw wet and stormy winters of Northwest Europe (Scotland and Scandinavia), the chief characteristics of its economic life reappear—or are reappearing as economic life develops—in regions of similar physical type on the Pacific Coast, in Washington, British Columbia, and

southern Alaska, in south Chile, in Tasmania, and in southern New Zealand.

In rugged interior regions, where transportation is difficult and expensive, invariably we find the money crops developed are of small bulk and high value; corn whiskey in the Kentucky Mountains; opium in Northwest China; coffee on the plateaus of Columbia; cocaine on the rugged eastern slopes of the Andes in Peru and Bolivia; butter and cheese in Siberia and New Zealand and Switzerland; tea in Central Japan and in the Assam Hills; these are but a few instances. So universally is this the rule that a general principle may be developed to the effect that the developed export resources of remote and rugged regions consist of high-valued, low-bulk goods, and the relation of value to bulk is roughly proportional to the degree of inaccessibility of the region.

These are all obvious and well-known illustrations among many that could be cited. They are suggestive of the influence of environment. But the student soon discovers that human activities are not always so closely related to the natural regions into which the earth may be divided, and that many economic features are not so obviously tied up to climate or topography or location or soils. Physical environment frequently does not appear to be the most potent force in shaping the existing life of a group. Migratory peoples bring with them into a newly-settled region, for example, methods of agriculture well adapted to the regions they have left, but ill adapted to the new regions to which they have come. It may be that for long periods the methods employed in the new environment reflect the method developed in the old environment and are ill adapted to the new. The farming methods of humid Europe and eastern United States first employed in western United States finally gave way, after much suffering and loss, to the conditions of aridity west of the 100th Meridian and a new and different type of agriculture has developed.

It is the task of the geographer to describe the region, establish the relations that do exist between the environmental facts and the economic, show how and to what extent other factors have modified the geographic, or the geographic modified the other factors that are at work in shaping the life of the region. Particularly is it of great practical importance, having established principles of relationships,

to point out how far the economic life of the region is failing to take full advantage of the natural opportunities; or to show, for an undeveloped region, what the probable or possible opportunities are for future development.

This type of regional economic geography can be of great value to the economist, to the historian, to the political scientist, to business, and to society in general. To describe scientifically the "economic landscape" and to explain and understand it, to develop principles by which one may soundly interpret the possibilities of a region and its limitations, as a place in which man can live and make a living is the distinctive field of the economic geographer.

See also "Man, the Adapter of His Environment," page 7.

3. THE FRONTIER IN AMERICAN HISTORY[5]

Behind institutions, behind constitutional forms and modifications lie the vital forces that call these organs into life and shape them to meet changing conditions. The peculiarity of American institutions is the fact that they have been compelled to adapt themselves to the changes of an expanding people—to the change involved in crossing a continent, in winning a wilderness, and in developing at each area of this progress out of the primitive economic and political conditions of the frontier into the complexity of city life. American development has exhibited not merely advance along a single line, but a return to primitive conditions on a continually advancing frontier line, and a new development for that area. American social development has been continually beginning over again on the frontier. This perennial rebirth, this fluidity of American life, this expansion westward with its new opportunities, its continuous touch with the simplicity of primitive society, furnish the forces dominating American character.

At first the frontier was the Atlantic coast. It was the frontier of Europe in a very real sense. Moving westward, the frontier became more and more American. As successive terminal moraines result

[5] Adapted from F. J. Turner, *The Significance of the Frontier in American History*, in the *Fifth Year Book* of the National Herbart Society, and an earlier edition in American Historical Association, *Report*, 1893, pp. 199–227.

from successive glaciations, so each frontier leaves its traces behind it, and when it becomes a settled area the region still partakes of its frontier characteristics. Thus the advance of the frontier has meant a steady movement away from the influence of Europe, a steady growth of independence on American lines.

The most important effect of the frontier has been in the promotion of democracy here and in Europe. The frontier is productive of individualism. Complex society is precipitated by the wilderness into a kind of primitive organization based on the family. The tendency is anti-social. It produces antipathy to control, and particularly to any direct control.

The frontier states that came into the Union in the first quarter of a century of its existence came in with democratic suffrage provisions, and had reactive effects of the highest importance upon the older states whose peoples were being attracted there. An extension of the franchise became essential. It was *western* New York that forced an extension of suffrage in the constitutional convention of that state in 1821; and it was *western* Virginia that compelled the tidewater region to put a more liberal suffrage provision in the constitution framed in 1830, and to give to the frontier region a more nearly proportionate representation with the tidewater aristocracy. The rise of democracy as an effective force in the nation came in with western preponderance under Jackson and William Henry Harrison, and it meant the triumph of the frontier—with all of its good and with all of its evil element.

So long as free land exists, the opportunity for a competency exists, and economic power secures political power. But the democracy born of free land, strong in selfishness and individualism, intolerant of administrative experience and education, and pressing individual liberty beyond its proper bounds, has its dangers as well as its benefits. Individualism in America has allowed a laxity in regard to governmental affairs which has rendered possible the spoils system and all the manifest evils that follow from the lack of a highly developed civic spirit.

To the frontier the American intellect owes its striking characteristics. That coarseness and strength combined with acuteness and inquisitiveness; that practical inventive turn of mind, quick to find expedients; that masterful grasp of material things, lacking in the

artistic, but powerful to effect great ends; that restless, nervous energy; that dominant individualism, working for good and for evil, and, withal, that buoyancy and exuberance which come with freedom—these are traits of the frontier, or traits called out elsewhere because of the existence of the frontier. We are not easily aware of the deep influence of this individualistic way of thinking upon our present conditions. It persists in the midst of a society that has passed away from the conditions that occasioned it. It makes it difficult to secure social regulation of business enterprises that are essentially public; it is a stumbling-block in the way of civil-service reform; it permeates our doctrines of education; but with the passing of the free lands a vast extension of the social tendency may be expected in America.

See also "The Transition to Laissez Faire," page 239.

4. THE CHIEF USES OF LAND[6]

A classification of natural resources (or land) used by man may be made as follows:

- I. Subsurface utilization
  - 1. Water
  - 2. Minerals (including oil)
  - 3. Gas
  - 4. Stone
  - 5. Salt
- II. Surface utilization
  - 1. Site appropriation
    - *a*) Manufacturing
    - *b*) Mercantile
    - *c*) Residence
    - *d*) Recreational and educational
      (Parks, forests, and streams; highways; museums, theaters, churches, schools)
    - *e*) Transportation and communication
      (Highways, railroads, canals, rivers, lakes, oceans; stations, ports, and other terminals; telegraph and telephone routes)
  - 2. Soil appropriation
    - *a*) Arid land

[6] Prepared by R. C. McReynolds.

(1) Irrigable (including irrigation reservoirs and ditches)
(Farm, garden, and orchard)
(2) Non-irrigable
(Timber, grazing, dry farming, desert)

b) Humid land
(1) Natural use
(Forest and pasture; swamps—rice, hay, cranberry, etc.)
(2) Cultivated use
(Forest, garden, orchard, and farm)

III. Super-surface utilization
1. Aircraft use
2. Radio use

Comparatively little land that is marketed today is in a state of nature. Man digs wells to obtain water for human and animal consumption and for irrigation; bores through soil, rock, and sand to obtain oil and gas; sinks shafts and carves out vast chambers underground in the process of obtaining coal, iron, copper, zinc, lead, gold, silver, and other minerals—unless he can obtain them by merely stripping off a surface layer of soil and rock or can get them on the surface of the ground; quarries rock; and extracts salt from lake beds or from the soil at the salt licks anciently used by wild animals. Man erects upon land buildings of multitudinous sorts in order that he may carry on manufacturing or trade, provide homes and places for recreation and education, and secure facilities for communication and transportation. The configuration of the land is much changed. The efforts of man to provide food lead to further efforts being spent upon the soil itself. Some desert land is transformed into humid land by the application of water from artesian wells or from irrigation reservoirs and ditches. Other dry land man makes produce some economic goods. Man appropriates forests, pastures, and swamps; and in addition cultivates land that timber, fruit, vegetables, grain, and live stock may be produced on it. Even the air is being used by aircraft and by radio sending stations.

B. The Effective Use of Natural Resources

In early cultures or civilizations, a given group could, in the main, make use of only those natural resources which lay near at hand. If those were abundantly available, the group tended to live well; if they were scanty, the group tended to live meagerly.

Today the situation is vastly different. Of course it is still true that a nation is fortunate if it possesses abundant and varied natural resources within its own boundaries, but today man's increased power of communication and transportation, his increased ability to co-operate effectively with other peoples, and his modern organization of trade and commerce make it possible for a given group to have access to the natural resources of other groups—possible to have a considerable degree of world-unity in the use of natural resources. Upon the one hand this accessibility has tremendously increased man's power to live well; upon the other hand it has caused many problems which were formerly regarded as national problems to become international issues.

The development of science—especially the development of chemistry—has profoundly affected the problem of the effective utilization of natural resources. Upon the one hand, it has greatly changed our estimation of the importance of certain materials; some materials once highly esteemed have now shrunk in significance, whereas other materials once regarded as waste and useless are now regarded as of the utmost value. Upon the other hand, it has greatly increased our power of substitution of one material for another; the word "synthetics" is a symbol of this development. Of all such changes it may again be said that they have tremendously increased man's power to live well—and they have caused many problems which were once regarded as national problems to become international issues.

A problem much discussed today is the conservation of natural resources. This problem is clarified when we reflect that conservation really means wise utilization or effective use. This major issue of wise utilization immediately breaks up into the following subissues: Are there any natural resources concerning the use of which we should be parsimonious? In view of expanding science, is it necessary to be parsimonious? May it be advisable to use all the available natural resources to an extent and in a way that attempts to protect neither us nor future generations against the exhaustion of those resources? How shall we make fully available to man's use resources that are present only in certain parts of the world? What are the most effective ways of applying the other social resources, such as labor and capital goods, to natural resources?

The following issues,[6a] if kept in mind, will cause the reading selections in this section to yield larger results:

1. In what types of cases has conservation of natural resources become a pressingly significant problem?
2. What changes in our social institutions—social organization—would facilitate conservation?
3. What are the more significant relationships of the growth of scientific knowledge to conservation?
4. What natural resources are of particular significance today in international relations?
5. Everything considered, what are the main elements in the problem of the more effective utilization of natural resources?

1. WASTE OF NATURAL RESOURCES[7]

It is not difficult to draw a very gloomy picture of the despoliation of a continent. The rape has been colossal and unparalleled in history. More difficult is the attempt to appraise the real economics involved, for, on analysis the simple dramatic sequence breaks down into many baffling and confusing parts.

Of course, it is conceivable that tomorrow or next day some new invention may revolutionize the whole case against waste in this category. If we could suddenly get unlimited cheap power out of the winds or out of the tides, the tears shed for devastated deposits of coal, oil, and natural gas would be largely maudlin ones—though the problem of by-products other than power would still remain. Similarly cheap nitrogen from the air would cause us to forget the ravages of the soil. Invention, we are ready to admit may knock the bottom out of much of the case for wasted raw materials—but such inventions are still in the womb of time, and to date the indictment stands.

Coal.—Beyond the wastes of excess capacity and idle man-power, how, specifically, is coal wasted? There are three main sources of preventable tonnage loss:

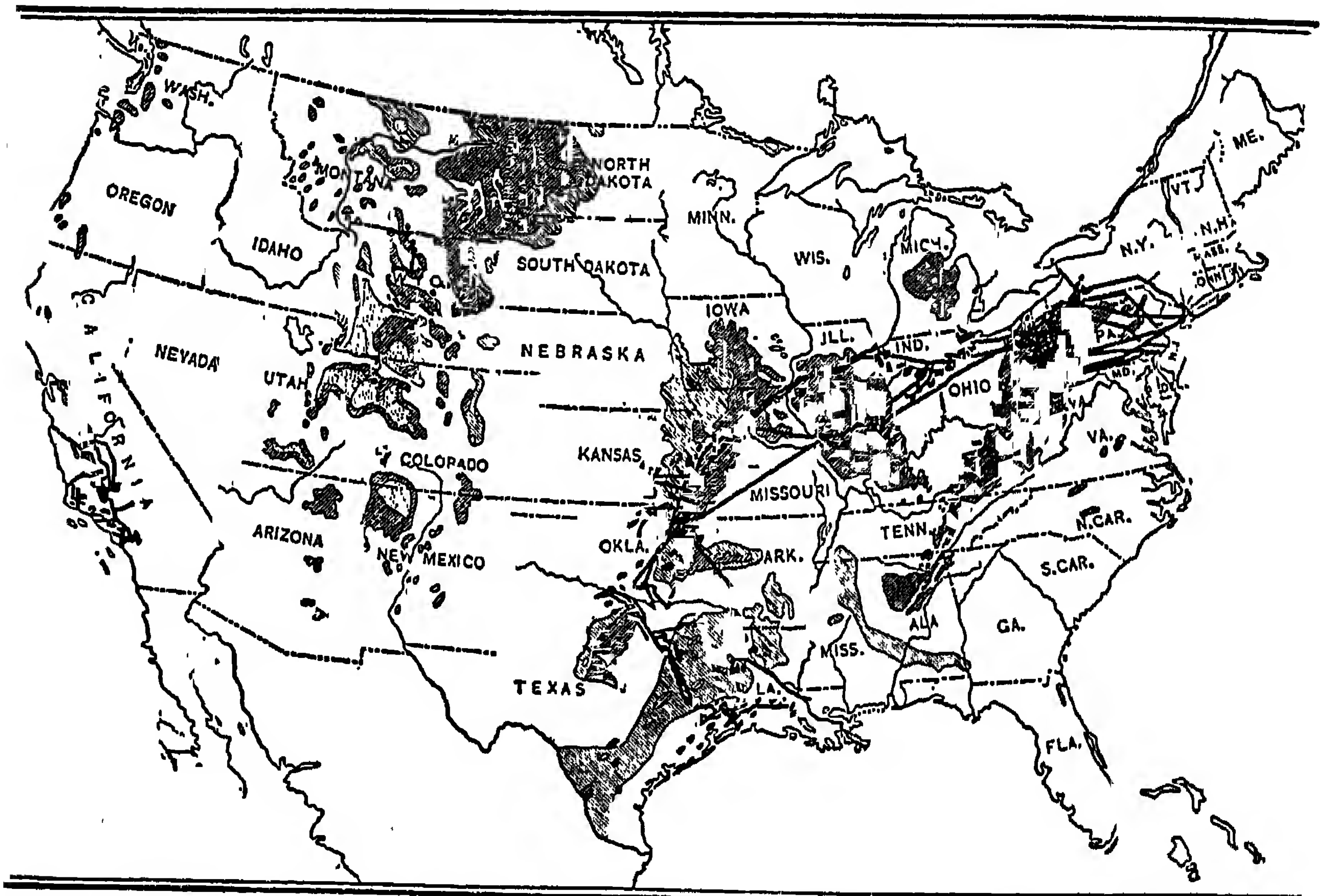
1. Bad technical methods underground.
2. Bad technical methods in steam-raising and heating.

[6a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 58–61. (University of Chicago Press.)

[7] From S. Chase, *The Tragedy of Waste*, pp. 233–64. By permission of The Macmillan Company, publishers.

3. Failure to link coal and water power into regional super power systems.

And, perhaps even more serious still, is the failure to salvage by-products. Untold riches in fertilizers, dyestuffs, chemicals are allowed to go up in smoke—their only function to increase the ugliness, the ill health, and laundry bills of our cities. The smoke nuisance is thus a knife with a double edge—we waste power, heat, and by-products, in order to waste health, beauty, and cleanliness.



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THE COAL FIELDS, OIL FIELDS, AND PIPE LINES IN THE UNITED STATES

Mr. Hugh Archbald after long experience as a mining engineer, concludes that for every ton of coal brought to the surface, another ton is needlessly left in the mines; and that—if the technical arts of mining were fully utilized—one man, with no more effort, could do the work of four.

The governing policy of working the big seams—"skimming the cream"—destroys the thinner seam in the process. Coal mining is not the careful exploitation of a limited natural resource with a view to scraping the platter clean as the exploitation progresses; it is a furious

and chaotic enterprise in competitive salesmanship with a view to catching the market today, and let tomorrow take care of itself. There are technical methods for careful mining—the long wall method, for instance, that takes all the coal which can be taken; but American practice, governed by the hope of quick profits—or, what is more common, the hope of averting losses—clings to the antiquated room and pillar method, with its great margin of waste.

Figures from the Geological Survey and the Bureau of Mines summarize the waste of an average ton of soft coal burned in a steam boiler as follows:

	Pounds	*Per Cent*
Lost in mining	600	
Lost from mine to boiler room	126	
Gases going up stack	446	
Lost by radiation	51	
Lost in ash pit	51	
Lost in converting heat into mechanical energy	650	
Total losses	1,924	96%
Final utilization	76	4%
Total tonnage	2,000	100%

Thus only 4 per cent of the original ton is finally utilized. The combined losses aggregate 96 per cent. This is, of course, the theoretical table of the exact scientist. The 650 pounds lost in converting heat into mechanical energy is true enough, but only a fraction of the loss is preventable.

If every drop of the annual rainfall could be converted into electrical energy, the total would just about equal the present consumption of energy derived from coal in the United States. Obviously only a fraction of the rainfall can be so converted through the power of falling water in streams, and thus we have to face the plain fact that "white coal"—water power—can never act as a complete substitute for coal energy. What water power can do, is to diminish the annual amount of coal needed, and thus lengthen the life, and help to preserve the by-products, of the coal beds. Scarcely 15 per cent of the water power readily available has been developed to date; and only 7 per cent of that available if storage reservoirs were introduced. From

80 to 90 per cent of the horse-power to be freely taken from falling streams thus runs to waste. Why? Because it has been cheaper to skim the cream from coal and oil, with their relatively smaller capital cost per unit of horse-power.

Water power may be introduced at isolated points into the industrial system to some advantage, but the great potentiality of the savings to be made from it is only realized through the co-ordinated planning of super power systems where coal is co-ordinated with water power. Giant power is one of the bravest and most exhilarating glimpses of Utopia which engineers and scientists have ever dreamed. It not only saves coal and oil, it electrifies the railroads, lightens the traffic burden, abolishes smoke and soot and grime, runs cheap power to the farm and the country town, make—as Ford makes—for industrial decentralization, for less congestion in the cities, for more life and vigor in the country. One's eye follows the sweep of the great high voltage lines as they charge the hill and dip to the valley—straight and true and infinitely powerful—and for an instant one glimpses the end of meanness, poverty, disorder; a world set free!

Apart from by-products, what is the approximate waste in tons of coal mined per year? We have been assured that for every ton taken out of the shaft another ton is left unreclaimable below ground. If 500,000,000 tons are taken out in a year, it follows that 500,000,000 tons are annually lost in the underground workings. Of the 500,000,000 taken out, ineffective utilization wastes at least half the tonnage. From which it follows that 250,000,000 tons more is wasted by reason of bad methods above ground. On the basis of Mr. Baum's super power zones, a material addition might be made to this figure, but waiving such addition as a margin of safety, it would appear that in terms of the natural resources alone, the annual bill of loss is some 750,000,000 tons. And to this we must add the tremendous tonnage of unreclaimed by-products—ammonium sulphate, gas, tar, dyestuffs and chemicals. Is it to be wondered that Mr. Hoover has termed coal the "worst-functioning industry in the country"?

Oil.—Petroleum, like coal, possesses a hideously wasteful technique for getting the product out of the ground, but unlike coal, its utilization once it gets to the pipeline, is, broadly speaking, reasonably efficient. What petroleum gains in this field, however, is quite

gorgeously made up for in winning oil from the ground. For every ton of coal produced, another ton is needlessly left in the mine; for every barrel of oil produced three barrels or more are left underground, or wasted in well operation. "Less than 25 per cent of oil in the ground reaches the pipeline."

Petroleum collects in great underground pools. Over the top of the pool gathers gas—valuable gas for two reasons: it has in it many of the properties of the oil itself; and only by its pressure downward on the surface of the pool, may all the oil in the pool be driven above ground. Now the pool and the gas over it form a geological unit. To be efficiently exploited it must be treated as a unit. One engineering control should govern it, allowing only enough wells—reasonably spaced—to give the most effective outlet for oil. Care must be taken to save the gas below in order to help the oil upstairs. Gushers must be resolutely choked; seepage and water infiltration must be guarded against; in brief the known technical arts applied, and the job done aright. In this way it is possible for nearly all the oil in the pool to reach the pipe line—and in no other way is it possible.

Meanwhile the ground over the pool is divided into property lots. The assumption of the law is that each man's boundary goes downward in a vertical plane, and so much of the pool as the plane bisects is his. But it isn't his, because of the aforementioned deplorable behavior of the pool. The pool will rush to the pipe which gets down first, or to certain pipes by virtue of their underground location. The owner of the lot is aware of this. So he drills as many wells as he can, as fast as he can, and preferably along the next owner's boundary line, in order to get the lion's share of the pool's activity. Thus the pioneer with his stark individualism, and his property laws which will not work with geological units, has succeeded in throwing away three barrels of oil out of four. While the engineer, who handles geological units with geological laws, could save the whole four barrels.

Coal, water power, oil and natural gas—the Big Four of power—present the outstanding examples of waste in inorganic natural resources. In an age of power they are particularly vital to our survey. But they do not constitute the only losses to be reckoned with in this category. Underground methods and utilization methods in tin, cop-

per, zinc and other metals have been subjected to much critical review.

Lumber.—When the Pilgrims landed on Plymouth Rock there were some 800,000,000 acres of virgin forest land in the country. There remain today 138,000,000 acres. In addition there are 114,000,000 acres in second growth, saw timber size, 136,000,000 acres in second growth, cordwood size, and 81,000,000 acres of original forest land on which nothing is growing.

Of the total annual cut, nearly 65 per cent is wasted in field and mill according to Arthur D. Little. In the yellow pine belt, the value of rosin, turpentine, alcohol, pure oil, tar, charcoal, and paper stock thrown away is three times the value of the lumber sold. Enough yellow pine is lost in milling methods, or left to rot on the ground to make double the paper tonnage in the United States. Meanwhile pulpwood for paper making is imported from Norway, loaded onto freight cars, and shipped 1,000 miles inland!

Not more than one board foot of finished lumber appears for every four feet cut in the woods. Two of the four are left in the forest, or fed into the saw mill burner or are lost in seasoning before the stage of rough seasoned lumber is reached. The third foot disappears in manufacturing. Hickory handle makers buy two tons of lumber and sell 400 pounds of handles. In many furniture factories, unskilled labor and inadequate supervision net only 30 per cent of the lumber received. The circular saw is used because it is quicker, but it leaves about three times as much sawdust on the ground as the band saw.

Of course all the wood in the tree is not economically utilizable. Beyond the leaves and the twigs and the roots, a certain amount of the stumpage would never pay for its conversion into usable products. There is a considerable margin of unavoidable waste. But there is perhaps an even greater margin which might be prevented if the pioneer gave ground to the engineer. When a tree is cut down, the lumberman hauls out in logs perhaps 80 per cent of its cubic volume. The rest is left to rot as stumps or tops awaiting the forest fire. In the mill, sawdust and slabs lop off another 40 per cent, to be burned as fuel or thrown away. Meanwhile the destructive distillation of a cord of this waste will yield:

50	bushels of charcoal
11,500	cubic feet of gas
25	gallons of tar
10	gallons of crude wood alcohol
200	pounds of acetate of lime

Furthermore much of this slab is suitable for pulpwood in the process of paper making. Into the hands of eager straphangers goes 2,000 acres of forest every year, for each and every large New York newspaper. If this maw could be fed from slab wood, now discarded, many thousands of acres of standing timber could be saved—saved, who knows, for an ultimate use of an even more rewarding nature. Wood like coal (and coal is only decayed and compressed vegetable matter) will yield great riches in by-products; and like coal, their extraction has been very largely neglected.

Lumbering methods have played into the hands of forest fires—magnificently. In the five years from 1916 to 1920, there were 160,000 reported fires which burned over 56,000,000 acres of land, destroying $86,000,000 worth of timber, while the damage to the nitrogenous humus of the soil was probably even greater. This is an average of about 10,000,000 acres a year. Besides destroying timber, soil, animal life—and often buildings, forest fires have ruined great areas for recreation purposes. The technique for their control is known, but its application advances very slowly. And as a corollary to timber mining, and the fire which, like Nemesis, follows, the slopes of the hills above the rivers are gutted, the watershed refuses to hold its water, and the streams swollen by waste, sweep down to waste and destroy the fertile fields below.

A SUMMARY

The volume of known waste in natural resources by physical count may be recapitulated as follows:

Coal	750 million tons per year
Water power	50 million horse-power per year
Oil	1 billion barrels per year
Natural gas	600 billion cubic feet per year
Lumber	5 billion cubic feet per year
Metals	Unknown total
Soil	Unknown total
Animal life	Unknown total
By-products and raw materials lost in manufacture	Unknown total

In this light it cannot be said that the conservation movement for all its brave promise has much to show in net accomplishment for the generation since its birth. By and large, the pioneer and his methods remain the masters of the nation's ever declining store of natural resources.

2. CLASSIFICATION OF RESOURCES FROM THE POINT OF VIEW OF CONSERVATION[8]

The real heart of the conservation problem presents an issue which taxes the resources of economic theory to the utmost. This issue is the problem of adjusting the conflict between the interest of present and future. In America the possibilities of conservation have been considered largely from the standpoint of natural science, while the economic limitations have been but little appreciated.

It is first necessary to determine the relation between the utilization of natural resources and their exhaustion. If utilization did not result in exhaustion, the problem of conservation, as it was stated above, obviously would not exist. Accordingly, natural resources may be classified as follows:

I. Resources which exist in such abundance that there is no apparent necessity for economy, either in present or future; for instance, water in some localities.

II. Resources which will probably become scarce in the remote future, although so abundant as to have no market value in the present; for instance, building stone and sand in some localities.

III. Resources which have a present scarcity—
   1. Not exhaustible through normal use: water-powers.
   2. Necessarily exhausted through use, and non-restorable after exhaustion: mineral deposits.
   3. Necessarily exhausted through use, but restorable: forests, fish.
   4. Exhaustible in a given locality but restorable through the employment of other resources of a different kind or of similar resources in different locations: agricultural land.

3. THE OIL INDUSTRY'S ANALYSIS OF ITS CONSERVATION PROBLEM[9]

The Board of Directors of the American Petroleum Institute at a meeting in New York on March 27, 1929, unanimously accepted the

[8] Adapted from L. C. Gray, "The Economic Possibilities of Conservation" in *The Quarterly Journal of Economics,* XXVII, 499–509 (May, 1913).

[9] Adapted from the *Texaco Star.* (The Texas Corporation.)

report of its General Committee on Conservation. The report is as follows: [The first five sections are here omitted.—Ed.]

Sixth: That so long as serious over-production exists in the world, a permanent organization within the American Petroleum Institute should be formed for study of the situation, not only in the United States, but throughout the world. Such an organizaion would work closely with the Department of Commerce and the Federal Oil Conservation Board for the freest possible dissemination of knowledge of conditions in the separate regions and in the aggregate.

Seventh: That the present committees of the American Petroleum Institute, or new committees working under the general plan of the present committees, together with such sub-committees as the Board may consider desirable, take up for further study and action some of the topics suggested in the general chairman's address on March 15th, and we make the following suggested outline in this connection:

(1) General Committee, to

a) Ascertain whether Federal aid or legislation is now considered necessary, and if so, the extent and nature of such aid or legislation as would be needed to sustain control of production as well as to give the necessary support, if such authority is needed, to cooperate with other nations in the world wide conservation and orderly development of petroleum deposits; and to deal, to whatever extent is necessary and desirable, and permissible, with the world situation, having in mind that this is possibly essential to the success of any real, effective, conservation plan.

b) Determine whether we, as an American Nation, should find it desirable to encourage the same degree of restriction and conservation on the part of foreign fields as of our own, or whether it would be in our interest to assume the larger share of restriction here at this time in order to prolong the life of our own fields or deposits.

c) Consider what may, and should be, the attitude of countries which are producing petroleum as differing from those countries which do not produce. Should not the countries without production have quite as much, if not more, interest in the conservation and control of production as those countries which are exhausting their known supplies? Take such action as may be necessary to create accurate representations and importance of the plan which we are undertaking.

d) Determine more accurately the extent to which crude production, as a whole, may possibly be reduced to bring about a satisfactory reduction in stocks and constitute a more substantial conservation.

e) Determine what can be properly undertaken to encourage a check on wasteful consumption of petroleum products as a part of the conservation activities.

f) Assume the responsibility for maintaining, with such national and state aid as can be secured, the orderly control of production and making of such adjustments from time to time as are necessary to make the plan workable and effect the purpose of same.

(2) Regional Committees, together with such subdivisions, or State committees as the Board or regional committees may find desirable to appoint, should consider the following:

a) The possibilities of such control with such cooperation as is possible within the industry today.

b) Whether state legislation is necessary, and if so, the precise nature of such required legislation in each of the states, particularly where the overproduction situation exists and where it may most likely be a problem in the future.

c) To what extent the regulation and control of gas production will contribute to the plan and be an aid to the permanent success thereof, and take action to bring about an acceptable and satisfactory solution of this feature of petroleum production.

d) To what extent more uniform leasing contracts and provision for zoning, or unit operation, either voluntarily or by law, would be an aid, and try to agree upon a plan for such zoning as is essential in preventing extravagance and waste.

e) Determine what can be saved to the industry and to the consumer by a more orderly and more economic system of producing oil and of such drilling only in new developments as is necessary to clearly define the field and that will produce the oil under control, and compare this with the cost of waste of recoverable oil when there is no control, or when the oil is taken out rapidly, as in many instances, and water encroachments and gas depletion take place prematurely.

f) Ascertain the cost to the industry of storing and carrying such excess stocks as will probably accumulate if production continues at the present rate; and what can be saved if substantial underground deposits can be ascertained and maintained.

g) Determine what will probably be the effect of geophysical instruments and other scientific aids in locating oil deposits, and the desirability of encouraging such activities and discoveries with a view of having more accurate knowledge of deposits, and the effect of such determinations in giving stability to the industry. The effect of such discoveries with or without control of production. Also the advantages of such determinations as against the difficulty, expense and delay of development in the event known supplies should decline below the actual minimum market requirements.

h) Determine the cost to the industry of the present fuel oil situation as against the markets and conditions applying when fuel oil prices were such that coal

was on a competitive basis for steamship and shore installation, and ascertain what effect and advantages might be derived by the coal industry and possibly railroads and other affected interests if we were to reduce fuel oil manufacture by, say 50% under the 1928 production.

i) Determine as accurately as possible the probable recoverable oil from present known or producing fields of the world, as well as the opinion of those who are considered best qualified to determine or estimate the possible amount of oil that is yet undiscovered but that may possibly be made available in the future.

4. CONSERVATION AS APPLIED TO THE FUR TRADE[10]

The encroachment of civilization on areas which support wild life and a constantly growing demand have been steadily depleting the world's supply of furs. This movement, which began to be felt at the close of the last century, is now assuming a serious aspect. Some measures of conservation will be necessary to insure a supply for the future.

Every continent, almost every country in the world, makes some contribution to the stock of this common luxury. North America and Russia, including Siberia, produce the rarest and most desired skins. From Russia come ermine and sable while from Canada come silver fox, white fox, white bear and from Alaska, sea otter and seal. From South America on the other side of the equator comes chinchilla and from Bokhara, in central Asia, comes broadtail. So great has the demand for furs grown in the present century that today almost every species of fur-bearing animal is used under its own name or a pseudonym. The American muskrat, a country pest, has transformed waste swamp lands of the United States and Canada into profitable fur farms. The Australian rabbit that threatened ruin to that country's agriculture has been turned into a source of revenue, while the skunk and weasel, the alley cat and the Chinese dog have made a place for themselves in the fashion world under more attractive names.

As the world used more furs, more furs were produced. That is, more men went into the business, trappers went further afield and tapped new sources. This method succeeded in satisfying a rapidly expanding market with desirable skins at rising prices, but such a practice could not be continued without danger to future supplies.

[10] Adapted from "The World's Fur Supply," *Commerce Monthly*, IX, No. 10, pp. 23–27. (The National Bank of Commerce, 1928.)

Another factor that has presented a constant menace to the world's fur supply has been expanding settlements. As new lands are opened up people move in and clear away the forests and wooded regions, so depriving the wild fur-bearers of their homes and their food supplies. Although many of the smaller fur-bearing animals such as rabbits and skunks continue and even thrive in settled areas, a number of animals yielding more valuable pelts, such as fox and beaver, are driven out.

Conservation.—Exploitation of the world's fur supplies has not been allowed to go on uninterrupted or unmolested. Since 1900 measures for conservation have received serious consideration and a concerted effort has been made to perfect administrative organization. In Canada as in the United States, conservation measures have been left to the local governments. Practically every province of the dominion, as practically every state of the Union, has taken some action to restrict the activities of trappers. Licenses are required for both trappers and traders throughout Canada and parts of the United States. Closed seasons for the rarer animals and heavy fines for trapping out of season are other restrictions exercised in most regions. However, lack of uniformity and the great area covered by trappers, certain sections of which are very remote, greatly complicate the problems of enforcement.

One measure of conservation which has met with considerable success and bids fair to furnish a solution for part of the present problem is fur farming. The modern development of this movement had its beginning on Prince Edward Island where early in the 1880's several attempts were made to raise silver foxes in captivity. But it was not until 1894 that success was attained. With success assured in raising foxes for their pelts, experiments were tried with other animals. Some of these are raised under more or less natural conditions. Muskrats, for instance, are in most cases permitted to live in swamps, seek their own food and care for themselves, "farming" being nothing more than protection from independent trappers and to some extent from their natural enemies. A muskrat farm is fenced by sinking a wire mesh under the surface to prevent the rats from wandering away.

The United States government has also been active in this form of conservation. By a treaty with Japan, Russia and Great Britain the United States alone can take Alaskan fur seals and care is always

exercised to assure no decline in the herd. The skins are sold in the St. Louis market and the returns apportioned among Japan, Russia, Canada and the United States. In connection with the seal rookeries the Federal Government maintains several fox preserves where the herds are cared for and a strict closed season is kept, although the animals are not raised in captivity.

5. SCIENTIFIC RESEARCH AND NATURAL RESOURCES[11]

So long as a raw material is plentiful and cheap, there is little spur toward devising a man-made substitute for it. But as soon as the pinch of scarcity is felt or monopoly raises the price of the natural product wits are put to work to offset the limitation. Synthetics, therefore, have been called the weapons with which industry defeats monopolies of its raw materials. Camphor, for example, was long regarded as an almost impregnable natural monopoly, but today a large share of its best market, the United States, is supplied by the synthetic product.

Scarcely an industry exists which is not now affected by or dependent on these compounded products, which are remaking the organization of trade in many lines. "Synthetic" is here used broadly rather than in its strict scientific connotation. Rayon, the resin compounds, artificial leather, lacquer, celluloid, synthetic fertilizer, are a few of the comparatively recent contributions that science has made to modern industry. Others of outstanding importance are just coming to the stage of commercial utilization—the successful production of motor fuel from coal, for example. Practically no natural product is entirely safe from the possibility of competition from a synthetic rival. Sometimes years of endeavor find no commercial application. Rubber, for example, can now be made in the laboratory but at a cost still too high to compete with the natural product. Even though the synthesis of a product seems to baffle the chemist or the artificial product is too expensive to be commercially successful it is worth recalling that aniline (the basis of the present dye industry) was first isolated in 1826 only after seventeen years' research and then as a result of five men's effort. Even then more than thirty years elapsed before the

[11] Adapted from J. B. Collins, "Synthetics in Industry," *Commerce Monthly*, VIII, No. 8, pp. 3–12. (The National Bank of Commerce, 1926.)

final step was completed that provided the foundation of the modern coal-tar dye industry, the influence of which has gone far beyond the boundaries of chemistry.

The overcapacity that characterizes most industries gives rise to an intensely competitive condition which calls for lower production costs. Chemicals to take the place of natural raw materials and research to devise improved methods of manufacture offer a possible solution to this problem in many instances. Synthetics possess four advantages of paramount importance to the manufacturer in reckoning costs, which are calculated to make permanent their replacement of the natural product they supplant. These advantages are: price stability; usually lower prices since the new product must win its market from the older natural one; uniform quality; and rapid adjustment of supply to meet the demand. Synthetics are not artificial in the sense that they are an imitation of the natural product. They show a similar chemical composition, but being produced by carefully regulated rather than natural means they are of even quality with impurities and imperfections largely removed. Some synthetics have created their own market or satisfied a demand not met by natural products; in practically all cases synthetics have become so essential that those industries into which they enter could not now be carried on without them.

The coal-tar dyes are, perhaps, the best-known examples of the displacement of natural by synthetic products. But no extended discussion need be made here of either the dye or the drug industry. Both of them are largely dependent for their continued existence on synthetic compounds.

Nitrocellulose is the source of perhaps the most important group of synthetics outside the coal-tar products, a group that affects a very wide range of industries. Its base is cellulose, the structural material of the plant world. Nitrocellulose is made from wood, cotton or some other readily available cellulose treated with sulphuric and nitric acids. Rayon, so-called artificial wool, lacquer, cellophane, artificial leather and celluloid are some of the best known nitrocellulose synthetics.

One of the materials used in manufacturing the pyroxylin plastics is camphor; and this product exemplifies one of the most interesting

contests between a natural monopoly and a man-made substitute. Natural camphor is obtained from the distillation of camphor wood. For more than twenty years the Japanese Government has maintained a monopoly of crude camphor. With practically no competition, supplies were restricted and prices maintained.

A synthetic camphor had been developed years ago, but only recently is it being made in commercial volume. But within the past four years, when a new process was perfected, German synthetic camphor, by reason of its uniform quality and attractive price, has taken away a large part of the American trade which was Japan's best outlet. Early this year the Japanese Bureau of Monopolies, the government department which controls the output and sale of crude camphor, announced that prices paid to producers of Japan and Formosa would be reduced 25 per cent. in a direct effort to meet the competition of the German synthetic camphor.

A dramatic contest is that between natural and synthetic nitrogen fertilizer. Chile has practically a monopoly of natural inorganic nitrates in commercial deposit. A combination of Chilean nitrate producers was effected some years ago to regulate supply and prices. After several years of experiment, Germany, then the heaviest user of the Chilean product, began commercial production of synthetic ammonia in 1913. Nitrogen fixation by the cyanamide process had begun there in 1908. During the war Germany was entirely cut off from Chilean nitrates, and necessity forced the rapid development of synthetic processes to supply Germany's requirements for explosives as well as fertilizer. But since the war production has continued to expand. Thus Chile in little more than a decade has not only permanently lost its former best customer but has acquired a strong rival in the international markets.

In countries which do not have the United States' advantage of adequate petroleum supplies, the relatively high cost of motor fuel has hampered automotive development. Substitutes for gasoline as a motor fuel are reaching commercial practicability in Europe with the success of the coal liquefaction process. Experiments have been carried on in Germany for many years and recent announcements indicated that commercial production by the Bergius process was now possible. England is working on gasoline synthetics and French chem-

ists also have stated lately that a somewhat different process of coal liquefaction upon which they have been experimenting is now commercially practicable. France, however, suffers from the handicap of limited coal resources and the necessity of importing considerable quantities.

In the petroleum field itself improvements in refining such as the adoption of "cracking" processes have enormously increased the potential supply of gasoline and have given the industry a greater flexibility in proportioning the output of its various products to market requirements. By this process allied petroleum products can be converted into gasoline through molecular changes induced by the application of heat and pressure.

Broadly defined, a variety of synthetic materials are being used in building. The old-time slate or tin roof has been largely replaced by a variety of composition materials of which felt, tar, asphalt, cement and asbestos are among the constituents. Concrete, stucco, and composition wall-boards and floorings are frequently substituted for brick, stone, lumber and plaster.

Bakelite is one of the synthetic resins developed by American concerns. This material, familiar to every builder of a radio set, is a hard, amber-like product made of carbolic acid and formaldehyde and has been commercially manufactured for about 15 years. Bakelite now is practically a staple commodity for pipes, grinding wheels, jewelry, automobile accessories and other products. It is particularly valuable in electric insulation and mechanical fields because of its stability under normal conditions. Redmanol and condensite are other synthetic resins similar to bakelite.

Many synthetics of minor importance are of recent origin. Organic glass, made from synthetic resin, has lately been perfected. It is flexible, takes a high polish and possesses several advantages over ordinary glass, although its commercial exploitation is still in the beginning. "Dry ice," made of carbon dioxide, is being successfully used by ice-cream manufacturers, meat packers, and other users of refrigeration in place of ice. Ethylene glycol, a synthetic anti-freeze material, possesses the best properties of alcohol and glycerine and it is expected to offer serious competition to both these anti-freeze mixtures. A turpentine substitute and synthetic shellac are two other

recent additions to the list. Chemical tanning materials have been in use for some years and many of the remarkable effects seen nowadays are due to these tanning agents. Probably about half of the leather produced in the United States is now chrome tanned and chemical tannins are a genuine necessity.

European countries have devoted considerable attention to research, but in the postwar years financial difficulties have forced them to limit their activities. Until recent years the United States has lagged behind in industrial support of pure scientific research, owing largely to its rich natural resources. This indifference is changing, however, for American industry now recognizes the commercial value of research. Impetus to the movement has come through the campaign to establish a national endowment fund to advance pure scientific research. Its purpose is to raise a large sum to be used to promote research work in American universities, as it is realized that this type of scientific investigation is the foundation of all so-called practical research. Examples are the recent establishment of a fund for petroleum research; work carried on by the tanning industry; the research activities of the railroads, the building materials organizations and the leading chemical companies; the improvement in tire construction, to a large extent the result of laboratory work since 1921.

From $100,000,000 to $200,000,000 a year is now being spent on industrial research in the United States, and as this tendency is comparatively new in American industry this total may be increased considerably in the next few years. In addition to Federal research bureaus, several large industries and some thirty trade organizations carry on practical research. Further impetus to research results from the efforts of producers or manufacturers of a natural product to meet the new competition of a synthetic substitute by combining their efforts to study the possibilities for widening the use of the older product and improving its quality.

6. WORLD INTEREST IN BASIC RAW MATERIALS ILLUSTRATED BY MANGANESE[12]

The Russian Soviet Government in June, 1925, awarded to Americans the concession to operate the manganese mines of Chiaturi, the

[12] Adapted from "The Manganese Situation," *Commerce Monthly,* VII, No. 5, pp. 27–28. (The National Bank of Commerce of New York, 1925.)

most extensive deposits in the world. Competition was keen among international interests for this desirable award, which opens the way to an enlarged supply of manganese ore for the world's steel industry.

Manganese in some form is practically indispensable in the manufacture of steel, almost all of which contains it in certain proportions. In the production of ordinary steel by the Bessemer and open-hearth processes it is essential that a small amount of manganese be used and in making special manganese steels 10 to 12 per cent. of manganese may be added. The functions of manganese in steel making are to serve as a deoxidizer and recarburizer and to impart essential qualities of toughness and hardness.

In the open-hearth process manganese is added in the form of ferromanganese and in making the higher carbon Bessemer steel as spiegeleisen, each of which is an alloy of manganese and iron. Low-grade ores containing from 10 to 35 per cent. of manganese may be added directly in the smelting of pig iron without being previously converted into a ferro-alloy. Normally the standard manganese content of ferromanganese ranges from 78 to 82 per cent., that of spiegeleisen 18 to 22 per cent. and manganiferous pig iron contains from 4 to 10 per cent. manganese. Accompanying the trend in steel making from the Bessemer to the open-hearth process, demand for spiegeleisen yielded to more extensive use of ferromanganese.

Annual world requirements of manganese ore are estimated to be 1,750,000 tons. If the leaner ores are to be utilized a larger quantity would be required. More than 95 per cent. of all manganese ore consumed in the United States is used by the steel industry. The remainder is used in the manufacture of dry batteries, glass, chemicals and to a certain extent in paints.

A half century ago iron was used principally in the form of cast or wrought iron which requires no manganese. The discovery of manganese steel by Sir Robert Hadfield in 1883 gave tremendous impetus to the study of alloy steels. Other steel makers began research resulting in the discovery of a large number of additional alloy steels.

During the war the manganese situation was so acute that considerable sums were spent in developing manganese production particularly in the United States and Brazil. In the United States output increased from little more than 4,000 tons of ore in 1913 to more than

300,000 tons in 1918. High-grade manganese ore contains 35 per cent. or more of manganese. The deposits of high-grade ore in this country are sufficient to meet only a small portion of normal domestic requirements. With the slump of 1921 output fell off to 13,000 tons. World iron and steel production declined and this resulted in smaller demand for manganese. In 1923 the iron and steel industry in this country reached record proportions. Again the probability of a manganese shortage arose. For the time being increased production in India and Russia provided necessary supplies although at high prices. Recent developments in the Russian fields promise to furnish the world with a normal supply.

Although manganese deposits occur in some form in many parts of the world, it is not economical, except in case of emergency, to work most of the deposits outside of Russia, India and Brazil which before the war produced 95 per cent. of world supplies. Small quantities are shipped from Egypt, Cuba, Mexico, West Africa and Japan. Prospects appear favorable for increased supplies from the Gold Coast, British West Africa. There are possibilities of developing manganese mining in other countries but as yet the resources have been mostly speculative.

See also:
"Concentration in the International Field," page 877.
"International Relationships in Manufacture," page 280.

7. THE WORLD'S POWER RESOURCES[13]

A consideration of the dependence of civilization on power raises two important questions: What is the extent of the power resources upon which we rely at present, and to what new resources may we turn when our present energy supplies begin to fail?

The greatest source of energy that we use is coal. Coal stirs into life the wheels of most of our industries, carries most of the world's commerce, produces most of our electricity, and makes possible the large production of iron and steel. Coal is a non-reproducible resource. The physical limit need occasion no fear for the future, but all coal is not of equal quality and the supply for particular purposes may be quite limited, as is the case with anthracite. Some coal has so much

[13] From an unpublished manuscript prepared by E. L. Rauber.

sulphur in it that it is ruinous to use it in making some steels. Some has such a large percentage of ash and sulphur that it is poor fuel for making steam. Some is lignite or brown coal which makes a very poor fuel in its raw state. Moreover, a large fraction of the total supply of coal is in thin seams. Again, some is so deep that mining is very expensive. Part of the coal supply is scattered about in places that are very difficult to reach—in the Andes mountains of South America or in the Rocky Mountains in the United States. Only the direst need for coal may ever bring all these coal fields into operation.

Coal Resources of the World*

(Millions of tons)

Continent	Anthracite	Bituminous	Lignite	Total
North America	21,842	2,239,683	2,811,906	5,073,431
Asia	407,637	760,098	111,851	1,279,586
Europe	54,346	693,162	36,682	784,190
Australasia	659	133,481	36,270	170,410
Africa	11,662	45,123	1,054	57,839
South America	700	31,397	....	32,097
World Total	496,846	3,902,944	2,997,763	7,397,553

* From E. C. Eckel, *Coal, Iron, and War*, p. 108. (New York: Henry Holt & Co., 1920.)

North America has by far the greatest coal reserve. Canada possesses only 7 per cent of the world supply. Mexico and Central America have little or no coal. The coal lands of the United States are in six sections: Eastern, Interior, Gulf, North Great Plains, Rocky Mountains, and Pacific Coast. The last four of these sections possess by far the greater part of the United States' supply. In the first two are found all the anthracite and most of the best steaming coal. (There is some coal in Alaska.)

Asia possesses the next largest coal reserve. Five-sixths of the Asiatic supply is found in China and has remained untouched for centuries. The anthracite beds of the United States underlie only 500 square miles in Pennsylvania and are found in twisted and broken seams. In China there are in the Hoang-Ho Valley some 18,000 square miles of anthracite, lying in thick seams, level and undisturbed, and in some places outcropping on hillsides so that trains could be run right into them. There is bituminous coal to be found in all parts of China.

Of all the Asiatic countries Japan possesses the most meager supply and that is not of good quality. Asiatic Russia undoubtedly possesses extensive fields.

Europe's coal supply is found chiefly in four districts: the British Isles; the Rhine Valley, including the Ruhr and Saar Basins, the Namur field in Belgium, the Department du Nord and the Departement Pas de Calais in France; the field at the juncture of Germany, Poland, and Czechoslovakia, the richest portion being in Upper Silesia; and the Donetz Basin in Russia, bordering the Black Sea.

While coal has been cheap and plentiful we have asked for only the best grades, anthracite and the higher grades of bituminous. Three ways of extending the life of the world's coal pile would be to utilize lignite and peat, save the pulverized and slack coal which is now wasted, and to refine or distil the coal and save the liquid and gaseous products which are now largely wasted. Lignite and peat in their natural state are poor fuels because of the large percentage of water they contain; subjected to mechanical pressure at a temperature of about 300 degrees Fahrenheit, the moisture can be reduced to 6 per cent of the total volume and the heating power raised to 60 per cent or 70 per cent of that of coal.

Unlike coal electricity has no fixed limits to its future development. As long as there exists some mechanical power that can be made to turn a dynamo it will be possible to produce electricity. At present it is produced chiefly from two sources, steam power and water power —carbo-electricity and hydro-electricity. The dependence of electricity upon steam power in the United States is explained by the cheap and plentiful coal supply of the country. It is estimated that 200 million horsepower of electrical energy may be developed in this country with proper storage facilities for water—enough to turn every industrial wheel and light every building and street in the country. Moreover, this great energy resource is country-wide in its distribution.

Our neighbor, Canada, has water resources amounting to twenty-six million horsepower without storage. In Europe, Norway possesses unusual resources from her mountain stream, glacial lakes, and glaciers, and she leads the nations of Europe in the development of hydro-electricity. The Italians are using the snow-fed waterfalls of the Alps to make up for a similar lack of coal. Japan is turning to water

power to make up for a lack of coal. In India the waterfalls from three lakes ninety miles away can furnish the city of Bombay with 30,000 horsepower. The many fine waterfalls in South America are now being made to produce electricity to run railroads and growing industries. In Africa the power of the falls of Zambezi may some day be carried to the gold fields of Johannesburg, 700 miles away.

Petroleum, the energy resource most recently enslaved, is also the most limited in extent. Like coal, petroleum is a non-reproducible resource. The United States Geological Survey estimate of petroleum resources in 1921 was that 45 billion barrels remained unmined. Probable additional deposits were estimated at 20 billion barrels. The United States has about one-fifth of the total known deposits and one-seventh of all the probable total deposits of the world. Next to the United States the southern Russia–southwestern Siberia-Caucasus field is the richest in the world; this is largely under Russian control although some of the deposits have been given out in concessions to foreign companies.

The United States produces more oil and uses more oil than any other country, regularly furnishing about three-fifths of the world production. The result is that this country in 1921 possessed only 64 per cent of its original supply, of about nine billion barrels, while the rest of the world has preserved over 90 per cent of its original supply of 56 billion barrels. If the United States would produce only 450 million barrels a year it would find its supply exhausted by 1941 or thereabouts.

By developing the oil shale fields of the United States the exhaustion of our petroleum supply may be pushed centuries in the future. Kentucky possesses shale which would yield around 50 billion barrels. of oil; Colorado shale would yield another 80 billion barrels. These two states have tied up in shale deposits more than thirteen times the supply of oil that can be gotten from our own wells by the present known methods. Oregon, Nevada, Utah, Wyoming, Indiana, and Ohio all possess great beds of oil shale.

One of the possible sources of future power is the heat that the sun pours down on the earth. What is needed is to learn to harness it effectively. Between the equator and latitudes 45 degrees north and south this heat amounts to 8,000 foot-pounds per minute for each

square foot exposed to the perpendicular rays of the sun. If this could be converted into mechanical energy it would amount to one horsepower for each square foot of heating surface—more power than is now used from all our coal, waterfalls, and oil wells combined.

Another source of power that may be drawn upon in the future is vegetation. Our early steam engines and locomotives got power from vegetation by burning wood under the boilers. It is not necessary, however, to burn vegetation directly under steam boilers to get power from it, for a wide variety of vegetable substances can be made to yield alcohol by distillation, and alcohol can be used in internal combustion engines much as gasoline is now used. Germany makes considerable use of alcohol derived from potatoes. Fuel alcohol is also made in Cuba from sugar cane at a cost not far from that of gasoline. Experiments also show that vegetable oils may be used with success in the Diesel engine, the results being almost as good as when petroleum is used. Since many of these oils are tropical products it may be that in the future such oils may be produced for power purposes in places that are unfitted by climate for any other use. Perhaps some day the alcohol tanker and the cocoanut-oil tanker will be as common on the sea as the petroleum tanker is today.

Another tremendous source of energy that we have never learned to tap successfully is the heat latent in the earth. In Italy they have even planned to tap the volcano Vesuvius for power. More regular power could possibly be secured by boring into the earth. Such great depth would be necessary to get any great amount of energy, however, that it cannot be seen how this method would produce results at all justifying the cost in time and money. On the whole it promises little as a solution of the power problem in the future.

Still another source of power is the ebb and flow of the tides of the oceans. The simplest form in which tidal power might be harnessed would be to let the incoming tide flow into a kind of reservoir so that when the tide would go out the water could be allowed to run away over an artificial falls to produce electricity; storage batteries might be used to furnish current when the tide was coming in. A double system of turbines, one operating on the inflow and one on the outflow might be used to secure continuous production. The only places where tidal power could be harnessed at all economically would be where the

tide rises to comparatively high levels and where only relatively short walls would be necessary to cut off the tidal basin or reservoir from the sea. The Bay of Fundy in North America, for example, is practically a land-locked basin 400 square miles in area and having a tidal range of 40 feet; the headlands at the outlet are but 3 miles apart and through this narrow gateway it is estimated that over 100,000,000 horsepower of energy runs to waste every day.

One of the most interesting of all power possibilities is to be found in the speculation of modern scientists about the atom. Each of these atoms is thought to consist of a core of energy around which revolve tiny electrical charges. It is thought that some day it may be possible to break up the atom and release the energy which now holds it together and then harness that to do useful work. Perhaps it is only a dream.

See also:
"An Index of Energy Consumption," page 500.
"Power Developments in the United States," page 502.
"The Water Power Situation," page 516.

CHAPTER III

THE NON-PHYSICAL CULTURAL BACKGROUND

Purposes of this chapter:

1. To see how true it is that our producing activities are largely shaped by our cultural background. (In this chapter the non-physical cultural background is considered.)
2. To get an understanding of the more significant elements of the non-physical cultural background which condition production.
3. To reflect that the future of production rests in large part upon the future of our non-material culture.

What is man the producer? Beyond question, man is what he is partly as a matter of biological inheritance. His physical qualities and characteristics are thus to be explained, and many competent observers hold that a goodly share of his moral and mental characteristics are also thus to be explained. But, equally beyond question, man is what he is partly as a matter of social inheritance. The biological base is shaped by the culture in which it exists—getting as culture elements language, attitudes of mind, mental habits, and the countless other features that we have come to regard as distinctively human. For our present purposes we do not need to strike a nice balance with respect to the relative importance of physical heredity upon the one hand and social inheritance upon the other hand as determinants of man's qualities and attainments. It is sufficient for our purposes that we recognize that each is of great importance.

Although it is not worth while to enter upon the long and learned—and largely futile—dispute as to whether man "owes more" to biological considerations or to cultural considerations, it is appropriate to say this much: As best our experts can judge, man has changed little or not at all biologically in the last 500,000 years or more, whereas he has in that same period of time made tremendous changes in his culture. In our study of man's productive activities we may therefore regard the biological base as a fixed or given datum; and we may

properly give the major part of our attention to a study of the element which has possibility of change. In this element lies future developments in production.

As regards man's culture, it will facilitate discussion if we differentiate in our treatment the *physical* cultural background (illustrated by houses, tools, and all the other tangible or material impedimenta of civilization) from the *non-physical* cultural background (illustrated by the world of ideas, habits, and social institutions). It will be realized, of course, that this differentiation is arbitrary and unreal, being justified only as it may facilitate discussion. For example, it is clear that houses and tools have little or no significance except in terms of the ideas and habits associated with them; and many ideas and habits exert their influence in production through physical agencies.

The relationship of the non-physical cultural background to production is treated in this present chapter; the relationship of the physical cultural background to production is discussed in the following chapter.

A. The Origin and Meaning of Culture

It is easy to sense the significance of culture; it is difficult to state in any brief and precise way its content. If we assume that primitive man was biologically and in native capacities our equal, then the difference between his living and ours bears witness to the significance of changes in culture. But what is culture? Various answers have been given; that of Wissler serves our purpose well. As he sees the matter, the culture pattern is made up of a number of trait complexes such as the communicating system, material traits, art, mythology and scientific knowledge, religion, social systems, property, government, and war. Under these nine headings, as greatly elaborated as one wills, can be tabulated all the facts of any given culture and of all cultures. "Here is the human pattern."

In chapter iii of Part I (pp. 245–68) we saw something of the ways by which culture is conserved, selected, accumulated, and transmitted; and in particular we saw the functions of invention and diffusion in cultural change. With this as a background, it should greatly influence our understanding of production as it takes place in the modern order, if we should secure a working knowledge of the main currents which have shaped our culture—assuming as a starting point

the culture of Neolithic man. That is the main purpose of the present section.

No one should have any doubt that culture does profoundly influence our economic activities. Suppose that all of us now living in the countries of Western civilization should suddenly disappear, leaving behind us all the material trappings of our culture. Suppose that at the next instant our places were taken by untutored Neolithic savages. The producing activities of these savages would be quite different from the producing activities with which we are familiar.

The ideology of these savages would not enable them to operate as we operate today. As regards material equipment, to take only one illustration, the probabilities are that many kinds of existing equipment would disappear through the slow process of deterioration and decay, without these savages being able to learn how to make use of them. The whole mental outlook of these savages would be such that they could not make the same use of our physical equipment that we make.

This illustration indicates how important the ideology of the group is in determining the character of its producing activities. In addition to what are usually called skills, techniques, and knowledges, other institutional aspects of the life of the group, the co-operative or non-co-operative attitudes of its members, the rules of the game under which the members operate, and many other similar considerations affect the way social energy is used in production.

As Western civilization has developed, certain attitudes of mind have grown up, certain practices have become customary, certain patterns of acting and thinking have congealed into institutions. Some of these attitudes, customs, and institutions are fundamental in the sense that they condition the whole range of our economic activities. A list of these fundamental matters would include private property, freedom of contract, individual initiative, competition, and various other forms of social control, such as custom, public opinion, religion, moral attitudes, law, and government.

In the readings of this section two issues are stressed:

1. What is culture?
2. How has Western civilization been shaped?

and a third should ever be in the mind of the reader:

3. In what particulars can culture be shown to shape the productive process?

1. THE CONTENT OF CULTURE[1]

Students of cultures find that the same general outline will fit all of them; thus, we say the facts of culture may be comprehended under nine heads as in the accompanying table; viz., Speech, Material Traits, Art, Mythology, Religion, Social Systems, Property, Government, and War. This outline can be greatly elaborated, if the reader gives his constructive imagination full play. It is, however, full enough for our purposes.

Now, if we take up our own culture and fit the details into this scheme, we see how readily they fall under these heads. So do the old cultures of Rome, Greece, etc. On the other hand, there are lowly, simple, crude peoples, like the Australians, who are said to have no culture. If we take literally many of the statements made by contemptuous writers on the subject, this would end the matter; but the facts are otherwise, for turning to the literature of the subject and taking first the main headings in our outline, we find all represented in the supposedly simple life of the Australian. Thus, even among very primitive peoples there are cultures which readily fall under the heads enumerated above.

We see that not only are the historic cultures, from the most primitive to our own, built upon one general pattern, but in some instances the materials are identical. And we now know that the same is true of the late paleolithic cultures, for they had fire, chipped stones, drew remarkable pictures, modeled in clay, and buried with their dead objects for the future use of the spirit. Incomplete though this picture of their life must remain, we may be sure that since it fits our one pattern at so many points, it will at the others as well. It is true that the skeleton of culture we have offered is a generalized one and so not a stern reality, and yet, it is as real as the osseous skeletal pattern for man as a whole—both abstract generalizations based upon objective data. Further, no one denies that this bodily pattern is part of a more comprehensive pattern for mammals as a whole; and in just the same way, one must admit that the culture pattern expresses the fundamental lines of the evolution of the phenomenon itself.

Now we have, as it were, set up a few categories which, taken together, seem to cover the entire range of culture content. Thus, under

[1] Adapted from C. Wissler, *Man and Culture*, pp. 74–78. (New York: Thomas Y. Crowell Co., 1923.)

speech we may include language, sign-talk, gesture, and all forms of writing, and so far as we now see, something under this category will be found in every culture. Yet the several tribal cultures will differ in kinds and number of trait-complexes falling under this head. If we turn to art, the facts are similar, and so on through the series. The pattern we have sketched here is the human pattern.

THE CULTURE SCHEME

1. Speech
   Languages, writing systems, etc.
2. Material traits
   a. Food habits
   b. Shelter
   c. Transportation and travel
   d. Dress
   e. Utensils, tools, etc.
   f. Weapons
   g. Occupations and industries
3. Art, carving, painting, drawing, music, etc.
4. Mythology and scientific knowledge
5. Religious practices
   a. Ritualistic forms
   b. Treatment of the sick
   c. Treatment of the dead
6. Family and social systems
   a. The forms of marriage
   b. Methods of reckoning relationship
   c. Inheritance
   d. Social control
   e. Sports and games
7. Property
   a. Real and personal
   b. Standards of value and exchange
   c. Trade
8. Government
   a. Political forms
   b. Judicial and legal procedures.
9. War

See also:
"The Economic Organization of Primitive Man," page 44.
"The Meaning of Human Evolution," page 266.
"Conscious and Unconscious Social Control," page 423.

2. THE SHAPING OF WESTERN CIVILIZATION[2]

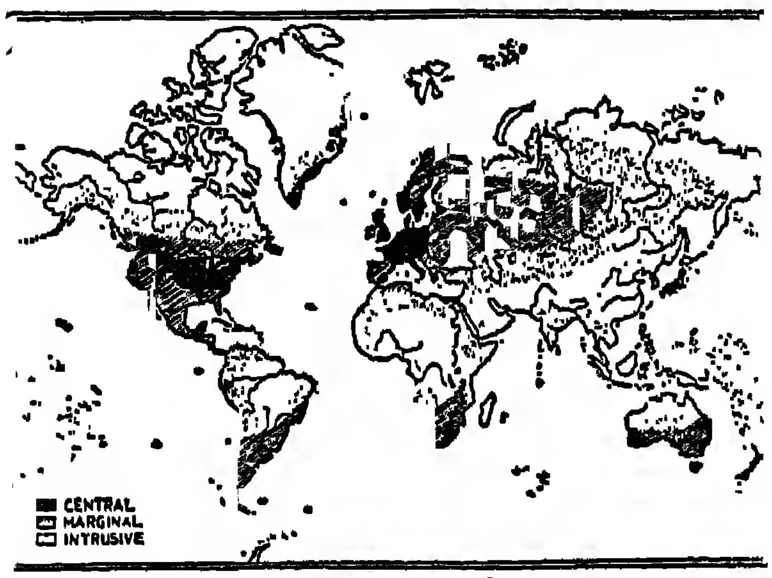
Four great cultures form the basis of western civilization.[3]—We have learned that a group is a body of persons who think and act alike—who have common interests; who have much the same ideals and aspirations. Now, in some real sense the peoples of western civilization, the peoples of our own Euro-American culture, constitute a group; unlike as they are in some ways, they are far more alike than different. The basic customs, the ways of thinking and acting, the

[2] Marshall, *The Story of Human Progress*, 408–15. By permission of the Macmillan Company, publishers (1925).

[3] Cf. Ellwood, *Social Problems*.

methods of harnessing nature, the methods of communication, the scheme of social organization, the ideals and aspirations of all these peoples are really much the same. For this there is a very simple reason: Very much the same influences have shaped or formed the living of all these peoples down through thousands of years.[4]

The Euro-American-culture group got its first great shaping as the result of the mixing and blending of four cultures: those of the Greeks, the Romans, the Jews, and the Teutonic tribes.



Courtesy of Wissler: *Man and Culture* (Thomas Y. Crowell Company)

AREAS OF EURO-AMERICAN CULTURE

The heaviness of the shading is proportional to the extent of the influence of Euro-American Culture.

As for the contributions of Greece, here, two thousand years ago, there lived a people who had developed, through still earlier thousands of years, certain customs, habits of thinking, social institutions, ideals and aspirations. They thought and acted in certain ways; they were a culture group.

There were, of course, many aspects of their culture, certain aspects being especially important for our present study. In the first place, the Greeks loved the artistic and the beautiful, so that art flourished among them in such forms as sculpture, architecture, music, and literature. In the second place, they became bold and independent thinkers. Aristotle's motto, "First of all, let's get facts," shows how their minds worked and helps explain the development of science among them. They were, without any doubt, a wonderful people. Although they held the center of history's stage for only a few hundred years, they made great contributions to human progress. "The world beautified and enlightened" is a short way of describing their contribution.

The second influence to mention is that of Roman life and civilization. These Romans, as they lived two thousand years ago, had also

[4] Robinson, *The Mind in the Making,* speaks of four historical layers underlying the minds of civilized men: the animal mind, the child mind, the savage mind, and the traditional (largely medieval) civilized mind.

developed, through still earlier thousands of years, certain customs, habits of thinking, social institutions, ideals and aspirations. They too were a culture group.

The aspects of their culture most important for present purposes are those which made them conquerors, rulers, engineers, and organizers. Their armies conquered and brought under one rule the greater part of the world known at that time. Their great roads and aqueducts and buildings were quite remarkable, when one remembers how poor the Romans were in capital goods as compared with us. Their systems of law and government were so good that in many ways they still serve as patterns.

The words, "conquerors, rulers, engineers, and organizers" prepare one to think of these Romans as a rather selfish lot who were quite willing to use brute force to get what they wanted. That is true. But they did conquer most of the European area, and they did build up a tradition of the nation, of law, of government, and of order. Although they conquered Greece, they were themselves conquered by the Greek culture and they carried it into their subject territories. But their own contributions were mainly in the realm of law and government. "The world organized and ruled," is a short way of describing their contribution.

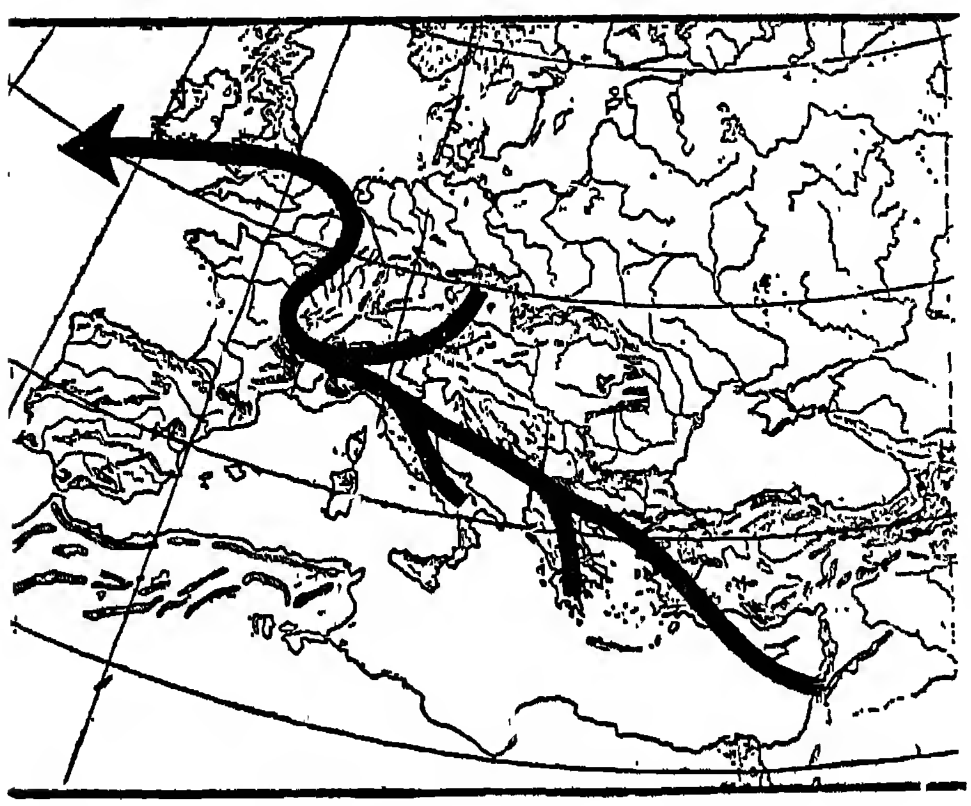
In Palestine two thousand years ago, there lived the third group, who, through still earlier thousands of years, had developed certain customs, habits of thinking, social institutions, ideals and aspirations.

In particular, they placed great emphasis upon the family and upon a form of religion full of ideas and phrases taken over from their family life. God was thought of as a father; all men were children of God and were, therefore, brothers. "Faith," "hope," "love," "righteousness," "justice," "service" are examples of the words that rose most frequently to their lips. This Jewish faith was modified and made more vital by the teachings of Jesus. In the form of the Christian religion, it spread to the Roman empire, and in the fourth century it became the official religion of the Romans. This meant that its teachings were carried through much of Europe. "The world a brotherhood" was the great central thought of those teachings.

The fourth great influence came from the Teutonic tribes. Two thousand years ago these warlike tribes lived in the gloomy forests of

north-central Europe. As was true of the other three groups, they had developed, through still earlier thousands of years, certain customs, habits of thinking, social institutions, ideals and aspirations.

These Teutonic tribes were fierce barbarians, much given to raiding and pillage. One branch of their descendants, for example, were the Vikings, who boasted that they were "sea-wolves" and lived up to the name by sudden dashing raids upon defenseless people. But with all their fierce plundering and burning and murdering, these Teutons made one great contribution. For various reasons, they developed a way of handling their affairs by little public meetings (folk moots, or meetings of the folk) in which every freeman could say his say and play his part. We have come to think of these folk moots as a "cradle of democracy and individual initiative."



THE FOUR STREAMS OF EUROPEAN CULTURE SPREAD TO THE NEW WORLD

As time went on, some of these tribes were conquered by the Romans. Later, however, the Roman Empire weakened, and new hordes of these barbarians swept down from the north. They took Rome itself in 476 A.D., and from that time on they were the ruling forces in Europe. Although they were thus the conquerors of Rome, they were themselves gradually taken captive to some extent by the civilization they crushed. In particular, they came to accept the Christian faith.

Within the last two thousand years there have occurred a mixing and fusing of these four great cultures. We often speak of our country as the "melting pot" because we are a sort of huge pot or cauldron into which, in the last hundred years, tens of millions of immigrants (mainly from the countries of Europe) have poured. But what a melting pot there was in Europe fifteen hundred to two thousand years ago! Into that cauldron went Greek art and science, Roman law and

government, Jewish religion and morality, Teutonic democracy and liberty. Into it went also liberal doses of selfishness, brutality, cruelty, piracy, ignorance, superstition, and trickery. It is not surprising that these elements did not always mix well; that the cauldron seethed and sputtered for centuries, and, indeed, is still doing so. Our civilization has strange streaks in it. As just one example of many, are we not sometimes Christians and sometimes sea wolves in our business dealings?

Later forces have helped to shape the product of those four great cultures.—At least three great forces have affected this European melting pot since the time when the four great cultures were poured into it. The first emphasized and developed the ideals of the warrior class; the second, those of the business class; the third, ideals of individual freedom.

Among all peoples who have enlarged the gens into a tribe or into a state by war and fighting, there has arisen a warrior class[5] that has, for the time, practically run the affairs of such peoples. Naturally, the members of this warrior class come to think and act in much the same way, and in time they develop standards, ideals and aspirations.

The Europe that resulted from the barbarian conquests was at first a chaos of fighting and plundering. Gradually, however, there arose strong leaders of bands of warriors and gradually there arose nations whose monarchs ruled (in a more or less effective way) these leaders and their warrior bands in the feudal system. These fighting men were, upon the whole, a cruel lot who scorned their "inferiors" and treated them harshly. But they did have within their own group fine ideas of *courage* and *honor* and *loyalty*. The warrior must be loyal to his lord, even unto death if need be. He must protect the weak (of his own class), be generous, fight fairly, help damsels in distress, be brave, be a man of honor, be dignified, keep his word, and in general, "be a gentleman." Gradually these standards were imitated by the "lower classes" and became the ideals of the ordinary man. The current phrase "be a gentleman!" reflects this situation.

As the warrior class was rising to its greatest power, there began to be noticeable in the medieval towns, the beginnings of trade and industry. In time the towns had a class of manufacturers and traders

[5] Cf. Tufts, *The Real Business of Living.*

who, scorned by the warrior class, went about their work and came to have more and more influence.

As is true of any group, these medieval manufacturers and traders got to thinking and acting alike. At first they were a tricky, cheating, unscrupulous lot (as some business men are to-day), but gradually it came to be seen that such ways were not "right" and workable, and better standards and ideals arose. Since the towns were usually free (not ruled by the warriors), these "middle class" persons did not look up to and imitate the warriors. Instead they gradually developed ideals of square dealing, good measure, good workmanship, dignity of labor, honesty, trustworthiness, fairness, and thrift. And these ideals persist to-day.

Although the Teutonic tribes were great believers in the individual, several things had to happen before there could be the kind of individual initiative and democracy that exists to-day. Men had to be made (1) free in their thinking, including their religious beliefs, (2) free from rule by lords and masters, and (3) free to act on their own initiative in business.

It was no easy matter to get men *free in their thinking,* for their minds were held in the cake of custom. Through the Dark Ages the shining example of Greek freedom of thought was almost lost. But between 1100 and 1500 a great awakening, a religious reformation, the printing press, and geographical discoveries shook men's minds a bit free from custom. During the last one hundred and fifty years scientific thinking has greatly increased. Man is becoming able to think —to be free in his thinking.

The growth of the ideal of *civil and political freedom* was a slow growth. To-day, however, it is an ideal of more than ninety per cent of the peoples of Western civilization.

The ideal of *freedom of individual initiative* in business has also been a slow development. In the days of the medieval warrior class, their tenants in the vills or manors had little freedom in business. Most of them could not even leave the manor. All of them carried on their work in old customary ways. In the towns, the small manufacturers and tradesmen had more freedom, but even their actions were closely regulated by the "guilds," or associations, that they formed. Later, when the nation became strong and the guilds had weakened,

the nation kept up all sorts of petty restraints on the actions of business men.

Gradually, however, this was changed. Markets became wider and wider, thanks to discoveries and colonization. Society became more and more a "money society" that relied upon competition and the gain spirit. It came to be felt that society would fare better if it allowed business men more freedom to conduct their affairs as they chose, providing they did not choose to harm others. In general terms, business men to-day can go where they choose, make what they please, form such contracts as seem to them good, make what profits they can, subject only to a general supervision by society. The ideal of individual initiative in business has become generally accepted.

The significant fact found in the foregoing sketch of the forces which have affected our ideals is this: Ideals and aspirations grow and develop just as truly as does knowledge, or invention, or a social institution. We are not born with our ideals all packed away in us any more than we are born able to speak a language. So, also, the human race did not start out with a fixed and unchanging batch of ideals. It started with a meagre stock. It added to its stock, changed it, and subtracted from it as time went on.

See also:
"The Development of Individualism," page 231.
"The Processes of Social Change," page 256.

B. Skills, Techniques, Knowledge—Especially Science

Even the simple producing activities of primitive man depended upon certain bits of knowledge and technique; in our modern economic order we have but extended and improved this fund of basic ideas and skills. In picking berries from a bush, or in digging clams, knowledge of where and how to proceed and skill in performance are fundamentally important, just as they are in flying aeroplanes, curing disease, or co-ordinating the divisions of a business. All producing activity in any economic order is conditioned by the existing state of knowledge and by the perfection of available techniques.

It is not merely the specialized information and habits of particu-

lar occupations or tasks that constitute an important productive element, but in addition, the whole range of ideas and procedures which make a civilization what it is. Producing operations are determined in no small measure by man's development of language—spoken, written, and printed—by the existing knowledge of human nature, or by the conduct of educational and religious affairs. One must know where and how to pick berries, but he should know, too, whether they are forbidden by the gods, or are the property of another person. The general background is no less significant than the specialized equipment in determining the nature of economic producing activities.

Knowledge and skill accumulate and refine themselves generation after generation. Through written and spoken language, through the instruction of offspring by parents, and through a vast array of other social pressures and examples—often informal and unnoticed—the new generation receives the intellectual store heaped up from the past. Here and there an innovation occurs; it proves useful and is added to the heritage that passes on, or it is found wanting and is dropped by the wayside. This inventing and accumulating process is subject to spurts and periods of retardation. We appear to be in the midst of an epoch probably unprecedented in the speed with which the heaping-up process is occurring.

In our modern world the building up of new knowledge and new ways of doing things has become a recognized goal which is to be approached by a consciously formulated procedure, the so-called "scientific method." "Scientific method" refers simply to a particularly sound and rigorous procedure in finding answers to problems. It differs from ordinary sound reasoning only in that it provides a more explicit and formal statement of the factual grounds for its conclusions—that is, it insists on standardized and tested solutions to problems. The necessity for tested solutions leads to great emphasis on careful observation, on the painstaking collection of facts, and on the development and use of exact methods of measurement and calculation.

The significance of the method is obvious: it provides answers that *work,* solutions that are certain to be sound because they have been demonstrated to be in accord with the facts observed. Scientific knowledge is tested, measured, exact knowledge. Furthermore, since

it tends to be stated as a law or principle, it commonly has a wide range of application instead of the limited range characteristic of rule-of-thumb knowledge. It is this quality of scientific knowledge which justifies calling it a "multiplier" of man's powers.

The influence upon present-day producing activities of the scientific spirit and its products cannot easily be exaggerated. Industry and commerce are virtually built upon a foundation of scientific discoveries in the fields of mathematics, earth science, physics, chemistry, and biology; and today the social sciences are increasingly coming into use.

But it would be a great mistake to think of all applied knowledge and technology as the creations of science. Rule-of-thumb practices and unscientifically accepted conclusions play a tremendously important part now, as in the past, in determining the nature of productive activities. Industrial procedure is in many instances far in advance of scientific formulations. We may still legitimately speak of the industrial "arts," with all that that term implies as to special knacks and unstandardized creativeness. In agriculture or medicine, or even modern factory operation, with all their scientific procedures, it still is true that much of the activity is directed by "hunches," custom, and unsupported opinion. In matters involving the control of man himself—the human factor in production—this lack of scientific foundation is especially striking.

Whatever be the present limits of science in production, however, the outstanding fact is that the attitude, method, and power of control which science represents constitute one of the most distinctive characteristics of our age.

While there is no denying the practical achievements of science, there are those who seriously question whether science—in the sense of natural science—has not been running away with us; whether we have not become so concerned with advancing our control of the physical world that we no longer ask what we want to control it for. It has been suggested that the stupendous development of material civilization may be an interference rather than an aid to the living of fuller, richer lives for most human beings. This line of thinking has been used with special vigor as an argument for the necessity of developing the social sciences—the study of man and his needs and adaptations—

in a way that will keep pace with the progress of the non-humanistic sciences. How far the scientific study of man may carry us only the future can reveal. The barest beginning has thus far been made.

The foregoing discussion has indicated that science owes much to measuring, evaluating, and calculating techniques. These techniques have, however, a far wider range of usefulness in our society. It is evident, upon reflection, that the diverse elements of a specialized society cannot be co-ordinated unless these techniques are present. When the specialized society is one of individual initiative guided by the gain spirit—as is true of ours—the importance of such techniques is very great indeed.

As would naturally be supposed, our measuring, evaluating, and calculating techniques, such as our arabic numerals, our systems of weights and measures, or our device called money, reach far back in human history and are in the main traditional, non-scientific. In recent generations, however, we have become increasingly aware of the importance of *standards* in such matters, and much scientific thought is today being expended in improving and sharpening these techniques.

The readings in this section will be more meaningful if the following issues[6] are kept in mind:

1. In what ways have our skills, techniques, and knowledge been developed?
2. Precisely what is the significance of science in the productive process?
3. What are the chief manifestations and the significance of measuring and calculating devices in the productive process?
4. As best one can judge, what is to be the future of the productive process, as far as its dependence upon skills, techniques, and knowledge is concerned?

1. A SKETCH OF THE DEVELOPMENT OF SCIENCE[7]

Of course no single cause accounts for the difference between the modern economic order as it exists in the countries of Western civilization and the various economic orders of earlier times. Many, many

[6] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 67–71; 94–95. (University of Chicago Press.)

[7] Adapted from L. C. Marshall, *The Story of Human Progress* (trade edition), pp. 123–31. By permission of The Macmillan Company, publishers (1928).

factors enter into human development. But if one were pressed to name the most strikingly significant cause of the modern economic order, it is quite probable that he would say "the development of scientific knowledge." How did man become a scientist and what has that fact meant for his economic activities and his economic organization?

No one can say when man began to heap up the knowledge that was to become the science of to-day. Presumably the process began far back in the dim past. The trial and error stage, we know, is found even among animals. Cats and dogs and other pets learn to push doors open by the trial and error method; mice or birds or monkeys use the same method to get at food which had been put in a place hard for them to reach. Of course, early man could do as much.

Indeed, man had great advantages over animals in such work. He had a better mind and could think things out. He had a better memory and could store up in his mind the "ways that worked." He could learn that it was not worth while to repeat the ways that did not work. Then, too, the fact that he was a communicator enabled him to pass down to later generations knowledge of ways that worked. The result was that, as the centuries rolled on, a modest fund of knowledge was built up.

But there is a great difference between mere knowledge and science. Science is knowledge, but it is knowledge plus. "Science is exact, regular, arranged, classified knowledge." It is knowledge that has been carefully tested and measured and then put into the form of a general law. The savage knew a great many practical facts about stones and climate and food plants and animals. He had practical rules of thumb about making tools, raising foods, and many other matters. But he was thousands and thousands of years away from having general, scientific laws.

There could be no science until men had become able to tabulate, calculate, and measure.—It is readily seen why early man had such poor success in making general explanation of a sort that would today be dignified by the term scientific. Since science is exact, regular, arranged, and classified knowledge, it follows that man had to become able to measure, to count, and to classify before he could have scientific knowledge. Presumably hundreds of thousands of years went by

before earliest man could measure or count at all. Then other thousands of years went by before he became an orderly, systematic counter and measurer. Still other thousands of years went by before he became able to make general rules or laws of science.

There is every reason to believe that when man started to count,[8] he counted "on his body," and the race has counted by fives and tens since the time of the savage days when fingers and toes were thus used. Among the Tamanacs of the Orinoco the word five means "whole hand"; six is "one of the other hand"; ten is "both hands"; fifteen is "whole foot"; twenty is "one man"; and so on. As for our numbers, the Roman numerals I, II, III, etc., have come down from the days of picture writing, when a mark meant "one"—perhaps one finger.

As for keeping track of counting, the very words used show how it was done, for our word "calculate" comes from a Latin word meaning "pebble"; in early days people "calculated" by putting pebbles in heaps as counters. The Chinese abacus, or counting board, is just a device for keeping track, in separate columns, of the number of pebbles that have been set aside for units, tens, hundreds, and so on. Arabic numbers are merely another way of doing the same thing.

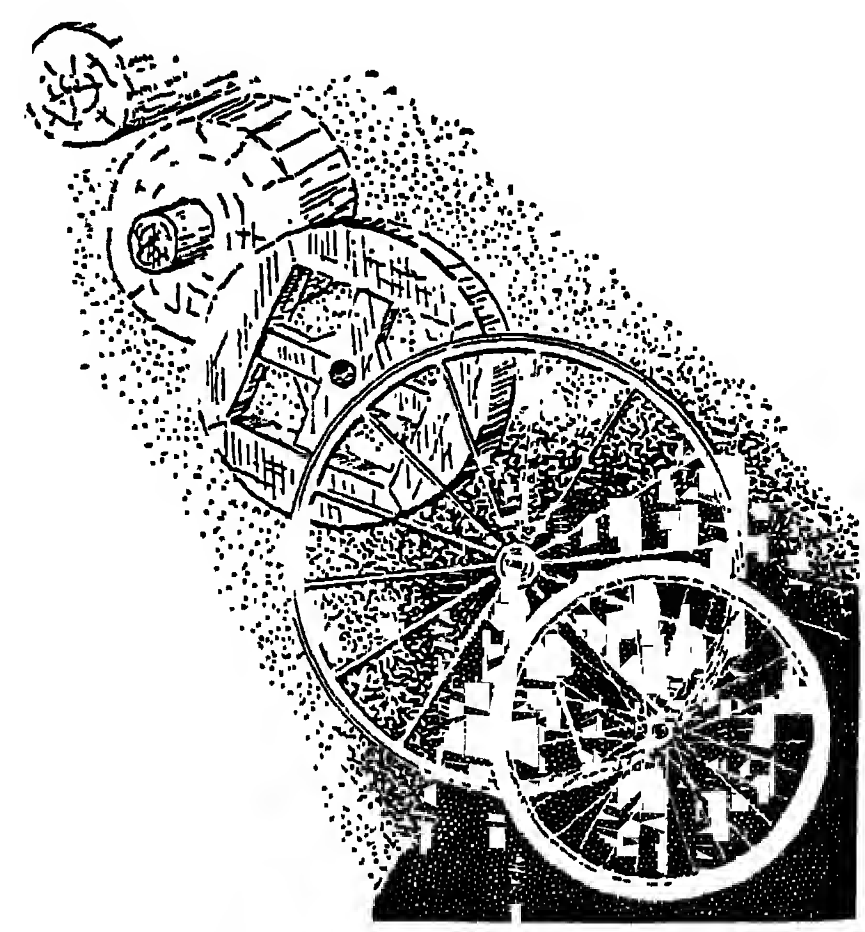
Precisely the same kind of story can be told of measuring devices. Man first measured, as he first counted, on his own body. He began to measure by putting his hands or feet alongside objects. From those days there have come down to us such words as "foot," "hand," "span," or "mile" (from the Latin *mille passus,* meaning "thousand paces"). The time came finally when people (the Egyptians and Babylonians were among the earliest) made pieces of wood or metal of exact lengths to serve as *standards.* From that time measuring devices did not vary according to the size of the man who did the measuring. As time went on, standards were fixed for other kinds of measuring, such as weight and volume.

To-day, the governments of all civilized peoples set such standards by law. Our own government maintains at Washington a Bureau of Standards whose employees are constantly studying and working on measurements and standards. In the vaults of this bureau are kept the standard copies of the metre, kilogram, yard, pound, etc. Here are kept measuring devices that are little short of marvelous: a balance that will weigh within one-two-hundred-millionth part of its load; cal-

[8] This is based largely on Tylor, *Anthropology.* (Macmillan & Co., Ltd.)

ipers that will measure to one ten-thousandth of an inch; ohmmeters that will measure electrical resistance from one one-hundred-thousandth of an ohm to 100,000 ohms; interferometers that will detect movement of one five-millionth of an inch; heat measurers of wonderful range and fineness. Year after year ways are found to make finer and finer measurements.

The great development of science has occurred in the last two hundred years.—When man became able to count and measure, he had the mental tools for beginning to make sciences, for he could now observe, measure, record, and arrange knowledge in an exact, orderly fashion. But it was a long, slow process.

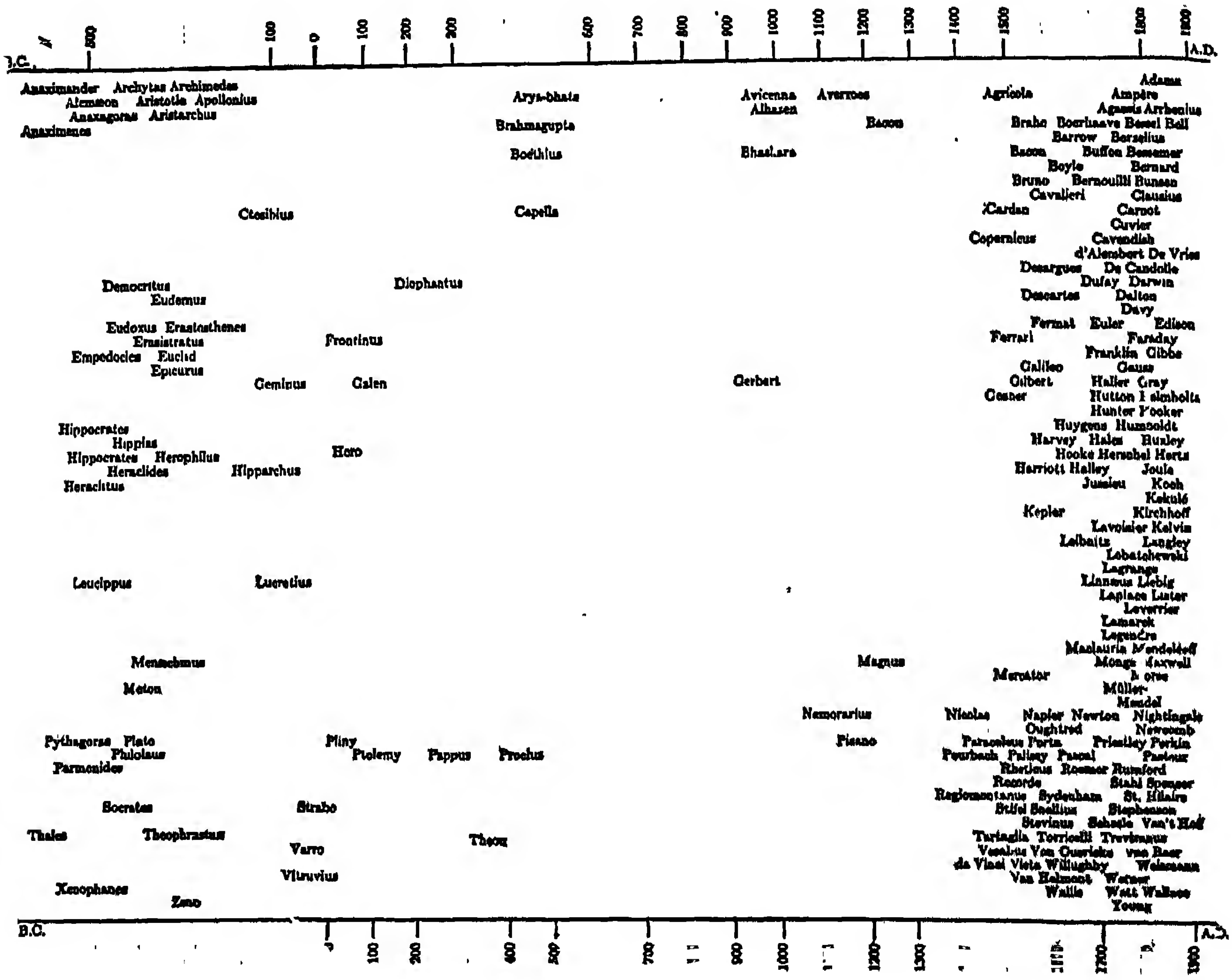


THE EVOLUTION OF THE WHEEL

Here is pictured the development from the log used by a savage to roll his canoe along the beach to the modern wheel with its pneumatic tire. We build upon the progress of the past.

Over four thousand years ago people who lived in Egypt, Assyria, and Babylonia had made much progress in the art of living together. They had good rules of thumb in many fields. Their practical knowledge was far enough advanced for them to have painters, gem cutters, smiths, musicians, shoemakers, tanners, wine makers, sculptors, brickmakers, and many others. These people had, furthermore, so developed their measuring devices that they had a good bit of orderly, arranged, exact knowledge about the movement of the stars and the length of the year and the hour. They knew how to survey and compute areas and volumes (geometry: *geometria* means earth-measurement and may well have sprung up in the Nile Valley where the floods made necessary much surveying every year to re-establish the boundaries). They knew many causes and cures for diseases. Since these ancient far-Eastern people had this measured knowledge, which they expressed in general rules, it is sometimes said that their work marks the birth of science.

These far-Eastern peoples did not carry their science very far. Some writers even refuse to call their knowledge *scientific* knowledge. It happened, however, that their knowledge spread in various ways to the Greeks, who carried it further and certainly gave it a scientific form. Later, it spread to Egypt and to the Hindus and Arabs, who



A Roll of Honor of Scientists

This chart shows that the Greeks made their greatest contributions 600–300 B.C.; then come some Hindu, Alexandrian, and Roman names. The chart is blank for about 300 years. Then comes a rebirth of learning, but there are not many names for another 500 years. The last 200 years mark the great outburst of scientific knowledge.

played their part in its development. Then followed a period of very slow progress—a period of decline, even—a period of "the dark ages." A "rebirth of learning," or Renaissance, or Great Awakening, took place in the thirteenth, fourteenth, and fifteenth centuries.

The main outline of the things that happened about the time of this rebirth of learning is a matter of common knowledge. Man rediscovered that the earth was round (the Greeks, Alexandrians, and Arabs knew it long before), and Columbus discovered America. Co-

pernicus (and Galileo with his telescope) demonstrated that the earth is not the center of the universe but that the earth and other planets

ONE CENTURY COMPARED WITH ALL PRECEDING CENTURIES[9]

Some steps in progress in the nineteenth century	*Some steps in progress in all preceding ages*
1. Railways	1. The mariner's compass
2. Steamships	2. The steam engine
3. Electric telegraphs	3. The telescope
4. Telephone	4. The barometer and thermometer
5. Matches	5. Printing
6. Gas illumination	6. Arabic numerals
7. Electric lighting	7. Alphabetical writing
8. Photography	8. Modern chemistry founded
9. The phonograph	9. Electric science founded
10. X-rays	10. Gravitation established
11. Spectrum analysis	11. Kepler's laws on the Motion of Planets
12. Anæsthetics	12. The differential calculus
13. Antiseptic surgery	13. The circulation of the blood discovered
14. Principle of conservation of energy established	14. Light proved to have definite velocity
15. Molecular theory of gases	15. The development of geometry
16. Velocity of light directly measured and earth's rotation experimentally shown	16. Gunpowder
17. The discovery of the uses of dust	17. Paper
18. Chemistry, definite proportions	18. Fire making
19. Meteors and the meteoric theory	19. Tool making
20. The proof of glacial epochs	20. Agriculture
21. The proof of the antiquity of man	21. Domestication of animals
22. Organic evolution established	22. Metals and pottery
23. Cell theory and embryology	
24. Germ theory of disease	

revolve around the sun and that far, far outside of this "solar system" there are great stretches of other suns and perhaps of other worlds

[9] The chart is adapted by permission from Wallace, *The Wonderful Century*. (New York: Dodd, Mead & Co.)

(Aristarchus, an Alexandrian thought so about 250 B.C.). The mariner's compass, which enabled sailors to go far out at sea without getting lost, and the printing press, which greatly increased man's ability to pass knowledge along to others, date from this period. The most significant gain, however, was in spirit, attitude, and outlook. Men became experimenters; they refused merely to "take another's word for it." They watched, observed, tried things, kept records of their experiments—all with the idea of making knowledge the "exact, regular, and arranged" knowledge that is science.

This sketch of the history of science is reflected in the chart on page 352 which shows the life periods of the great scientists. Although acquired knowledge has been heaped up over a long period of time, yet measured against man's long stay on the earth, science is a very new thing. Once it came into being, there was a long period of slow growth, a period of decline, a rebirth of learning, and a recent great outburst of activity. Since the chart comes down only to 1900 and includes almost no names of living scientists, it does not show that this outburst is still going on. If living scientists were included and the chart were brought down to the present day, its right side would be black with names. Clearly, the large development of science has occurred only in the last two hundred years. Its application in rules of action through our schools of technology is a matter of the last fifty or seventy-five years.

2. FOUR STAGES IN THE DEVELOPMENT OF THE USE OF KNOWLEDGE[10]

When I was a country lad of twelve, the state, as a means of protecting crops, offered a reward of ten cents for each ground-hog scalp turned in at the county courthouse. My father gave me a .22 rifle and told me that I could keep any money I got from ground-hog scalps. This was a task to a boy's liking. It is not surprising that I became a good marksman.

One day, while walking along a river which flowed through the farm, I saw some fish swimming. At that time the shooting of fish was not forbidden by the game laws of the state, so I tried my skill. I

[10] Adapted from Marshall, *The Story of Human Progress* (trade edition), pp. 110–13. By permission of The Macmillan Company, publishers (1928).

was not able to get a single fish. I tried again and again on succeeding days, using various schemes in my shooting, but I got very few fish. Happening to mention my difficulties to my father, he said, "Of course; you must aim below a fish in the water in order to hit it." When I asked him why, he could give me no reason. He simply said that he knew that it was true, that he had been told that was the way to shoot fish, that he had tried it, and that it worked. I went back to the river with his rule in mind, and, sure enough, it worked.

Quite without knowing it, I had illustrated in my fish shooting two stages, or steps, in the development and use of knowledge. The first stage is the trial-and-error stage which is "a groping after something by trying everything." One tries and tries various things. Some "work," or "are right"; others "do not work," or "are wrong." That was the stage I was in before I talked with my father.

This first stage is followed by a second stage in which one comes to use "rules" based on the ways that "work," without knowing *why* they work. Such rules are called rules of thumb. Perhaps if I had kept at the job of shooting fish I should have stumbled upon the fact that I needed to shoot below them. Others had done so and had passed that rule on to my father. He passed it on to me. But neither of us knew "the why" of it. We merely shot fish by rule of thumb.

A few years later I studied physics at the high school in the neighboring city, and one of my textbooks treated this very problem of shooting fish! In the book the problem was worked out by men of science who had found the "why" of it. Scientists had discovered, after much study and experimentation, that when a ray of light goes on a slant from one body (like the water) to a less dense body (like the air), the ray of light actually bends, or refracts, in the process, so that the fish was really nearer the bank of the stream than it seemed to be. A ray of light going from the fish bends at the surface of the water and goes to the eye of the observer in such a way that the fish seems to be farther away than it really is.

The physics book explained all this. It pointed out that since rays of light act this way, one needed to aim under the place where the fish seemed to be. This was a *rule of action* based on a *scientific law* about the way rays of light perform.

My high-school experience showed stages *three* and *four* in the

development and use of knowledge. The third stage is illustrated by the scientists who study how rays of light act under all sorts of circumstances and conditions. These men are not interested in shooting fish. They are curious about rays of light and eager to know how they act. After much study, experimentation, and measuring, they find that rays of light bend, or refract, certain amounts under certain conditions. They then draw up brief general statements ("laws" of science) about that bending, such as "a ray of light passing from a more dense to a less dense medium is refracted away from the common perpendicular." The word "science" comes from a Latin word which means "to know." Now, the "knowing," or knowledge, of the scientist is not vague. It is knowledge which has been carefully measured and tested and then stated in a general way. In brief, this third stage is that of the discovery and formulation of scientific law.

The fourth stage is that of making rules of action based on scientific law. These differ greatly from the rules of thumb of the second stage. To begin with, rules based on scientific knowledge are more measured and exact and accurate. They are worked out with instruments of precision; hence they give better results. More important still, they are *general* and may therefore be used for many purposes, thus multiplying man's powers. Take light rays. Science gives general statements about them. They *always* act in certain ways under certain conditions. There was nothing peculiar about their action in the fish-shooting case. They act the same way with other bodies. In other words, once it is known how light rays act, rules of action can be formulated not only for shooting fish but for other purposes as well. By way of an example of these other purposes, microscopes and telescopes constructed in accord with the laws of light open up new worlds! Clearly our powers are greatly increased when use is made of laws of science which are general in character.

Here is the field of the engineer.

3. THE ENGINEERING PROFESSION[11]

If the writer may modestly put forward a suggestion for a definition, he would word it: "The Engineer is he who by science and by

[11] Adapted by permission from F. R. Hutton, "The Mechanical Engineer and the Function of the Engineering Society," *Proceedings of the American Society of Mechanical Engineers*, XXIX (1907), 602–12.

art so adapts and applies the physical properties of matter and so controls and directs the forces which act through them as to serve the use and convenience of man, and to advance his economic and material welfare."

In making the following classification of engineers it is obvious that agreement cannot be secured from all as respects the number of branches to be recognized. With this apology and for the purpose in hand there are at least thirteen:

a) The mining engineer and his close ally, the metallurgical engineer, are concerned with the discovery and the winning and extraction from the earth of its buried treasures of oil, fuel, and rock. He touches the geologist and mineralogist on one side of his functions, and the chemist upon the other. Midway he allies himself to the mechanical engineer for the power to overcome his resistances and to the electrical engineer for its convenient transmission to the working point.

b) The electrical engineer is primarily entrusted with the transformation of mechanical or chemical energy into electric form, and its transmission in that form to the point of use, where it will be again converted into some other shape. The electrical engineer has made his own the question generating such electric energy for the solution of the problems of lighting, transportation of passengers by railway, and communication by telegraph and telephone. He touches the physicist in the realm outside his applications of science, and has the mechanical or hydraulic engineer next to him to supply mechanical energy to his generator, and the mechanical engineer beyond him, where his energy drives the tool, or operates the pump or the elevator. Where his energy is made to appear as high heat, he serves the metallurgist, the chemical engineer; where it appears as low heat or as light, he serves the individual members of the community directly, as he does in the problem of communicating speech. His field is very definite.

c) The naval engineer and marine architect is a specialized mechanical and structural engineer. His hull is a truss unsymmetrically loaded and variably supported: his motive power a definite yet widely diversified problem. He covers in addition a wide range of special problems when his vessel is also a clubhouse or hotel, on the one hand, or a powerful fighting machine upon the other.

d) The military engineer must cover both the defensive and the offensive department of his avocation. On the one side he is a structural engineer, and the problems of effective transportation enter his field, which he therefore shares with what is usually called the civil engineer. On the side of attack, the problems of ordnance both for its construction and for its operation take him into the field of the mechanical engineer and electrical engineer, and his problems touch those of the physicist and the chemist and the mathematician on the research and theoretical side.

e) The chemical engineer is a new applicant at the door of professional recognition in certain quarters. He is the engineer in charge of production or manufacture where the process or the product, or both, are chiefly or entirely dependent upon the theories and practice of chemistry. He shares his field with the metallurgical engineer as respects the manufacture of metals; he is a mechanical engineer as soon as the plant becomes large enough to warrant the application of power and machinery to the mechanical handling of his product.

f) The sanitary engineer is a specialist in hydraulic engineering in the applications of water supply and drainage as means to secure the well-being of the community as respects its public health. His co-workers are the bacteriologist and the physician. It would seem more serviceable, however, for the purpose in hand to group such men with what are hereafter to be called the civil engineers.

g) The heating and ventilating engineers, making a specialty of the sanitary requirements of enclosed houses as respects their fresh and tempered air supply, are really sanitary engineers, having, however, an outlook and a relation to mechanical engineering in the appliances of their function rather than toward civil engineering.

h) The refrigerating engineer is concerned with the transformation of mechanical or heat energy so as to lower the amount of such intrinsic energy in any material or space. He is most unassailably a mechanical engineer.

i) The hydraulic engineer is of two groups. The one type, concerned with the problems of the river or canal for navigation or for power with the dam and its accompanying details of waterways and controlling gatehouses and sluices; and with the gravity storage and distribution by mains of the city water supply has plainly his outlook

toward civil engineering. The other type, concerned with the water motor and its attached machinery for its operation, with the mechanical handling of water for city use or for power in industry, the designer of pumps and hydraulic utilization machinery, has his outlook equally definite upon the field of the mechanical engineer.

j) The gas engineer has two sets of problems: The one is the intra-mural manufacture and storage of his product, where his functions are those of the chemical manufacturer, and he should be both chemical and mechanical engineer; the other is the distribution problem for whose solution is required the skill and knowledge of a type which is unnamed, but which, logically in parallel with the hydraulic engineer above, should be called the pneumatic (or gas) engineer.

k) There is no recognized group of engineers of transportation, or transportation engineers. Such a group obviously exists, however, whether or not the name is attached to an organization inclusive of all, or is in general use. Such are the engineers of motive power on the steam railways, with the master mechanics and the signal engineers and the operative class on locomotives; such are the street railway engineers; the car builders; the maintenance-of-way engineers, the bridge engineers, the engineers of floating equipment. From the bottom of the rail upward, these have their outlook on mechanical or electrical engineering; from the bottom of the rail downward upon civil engineering.

l) The foregoing group does not claim to be exhaustive nor inclusive of all subdivisions of engineers even so far as it has gone. The current activities of the Engineering Building reveal bodies of municipal engineers, of illuminating engineers, of engineers concerned in fire protection, and many others. But the purpose has been to clear the way for the separation of the two most closely allied in function and service, the civil and the mechanical engineer.

It is plain that to the civil engineer belong as of right all problems relating to the canal, the lock, the river, the harbor, the dock, the sea-wall, the break-water, the highway, the aqueduct, the bridge, the viaduct, the retaining wall, the permanent way of the railway below the foot of the rail. He also has nearly the whole of the municipal problem in streets, sewage, distribution of water; the location of railways, with geodetic and other surveying, are his. He has the foundation of struc-

tures in any event, but may have to share the roof and the skeleton steel frame with other specializations. Tunneling is usually done by civil engineers, although it was originally a mining engineer's prerogative.

m) To the mechanical engineer, on the other hand, belong as undoubtedly, and as of right, the problems of the generation of power in power houses and power plants, and its transmission to the operative point unless this latter is done by electric means. It is also plain that to the mechanical engineer belong all design, creation, and manufacture of tools and machinery. This makes him therefore the natural administrator or executive of the production processes involving the use of machinery in factories and mills, and it is here that he finds his broadest scope and widest opportunity.

4. MONEY AS A CALCULATING AND MEASURING DEVICE[12]

Some years since, Mademoiselle Zélie, a singer of the Théâtre Lyrique at Paris, made a professional tour round the world, and gave a concert in the Society Islands. In exchange for an air from *Norma* and a few other songs, she was to receive a third part of the receipts. When counted, her share was found to consist of three pigs, twenty-three turkeys, forty-four chickens, five thousand cocoa-nuts, besides considerable quantities of bananas, lemons, and oranges. At the Halle in Paris, as the prima donna remarks in her lively letter, printed by M. Wolowski, this amount of live stock and vegetables might have brought four thousand francs, which would have been good remuneration for five songs. In the Society Islands, however, pieces of money were very scarce; and as Mademoiselle could not consume any considerable portion of the receipts herself, it became necessary in the meantime to feed the pigs and poultry with the fruit.

The first difficulty in barter is to find two persons whose disposable possessions mutually suit each other's wants. There may be many people wanting, and many possessed of those things wanted; but to allow of an act of barter, there must be a double coincidence, which will rarely happen. A hunter having returned from a successful chase has plenty of game, and may want arms and ammunition to renew the chase. But those who have arms may happen to be well supplied with

[12] From W. S. Jevons, *Money and the Mechanism of Exchange,* chap. i.

game, so that no direct exchange is possible. Sellers and purchasers can only be made to fit by the use of some commodity, some *marchandise banale,* as the French call it, which all are willing to receive for a time, so that what is obtained by sale in one case, may be used in purchase in another. This common commodity is called a *medium of exchange,* because it forms a third or intermediate term in all acts of commerce.

A second difficulty arises in barter. At what rate is any exchange to be made? If a certain quantity of beef be given for a certain quantity of corn, and in like manner corn be exchanged for cheese, and cheese for eggs, and eggs for flax, and so on, still the question will arise—How much beef for how much flax, or how much of any one commodity for a given quantity of another? In a state of barter the price-current list would be a most complicated document, for each commodity would have to be quoted in terms of every other commodity, or else complicated rule-of-three sums would become necessary. Between one hundred articles there must exist no less than 4,950 possible ratios of exchange, and all these ratios must be carefully adjusted so as to be consistent with each other, else the acute trader will be able to profit by buying from some and selling to others.

All such trouble is avoided if any one commodity be chosen, and its ratio of exchange with each other commodity be quoted. The chosen commodity becomes a *common denominator* or *common measure of value,* in terms of which we estimate the values of all other goods, so that their values become capable of the most easy comparison.

A third, but it may be a minor, inconvenience of barter arises from the impossibility of dividing many kinds of goods. A store of corn, a bag of gold dust, a carcase of meat, may be portioned out, and more or less may be given in exchange for what is wanted. But the tailor, as we are reminded in several treatises on political economy, may have a coat ready to exchange, but it much exceeds in value the bread which he wishes to get from the baker, or the meat from the butcher. He cannot cut the coat up without destroying the value of his handiwork. It is obvious that he needs some medium of exchange, into which he can temporarily convert the coat, so that he may give a part of its value for bread, and other parts for meat, fuel, and daily necessaries, retaining perhaps a portion for future use.

(A more complete statement of the function of money as a device useful for measurement and calculation is in Part III, chapter i.—Ed.)

5. CALCULATION AND MEASUREMENT THROUGH STATISTICS AND ACCOUNTING[13]

All sorts of business enterprises which are operated for profit depend more or less upon accounting for the control of their operations. This is true alike of farm, mine, factory, fishery, bank, railroad, insurance company, and wholesale or retail store. It makes no difference whether a business enterprise is organized as a partnership, a corporation, a business trust, an individual proprietorship, or some other form of the business unit. It makes no difference whether the persons desiring information are the managers and employees of the enterprise, the stockholders or partners, the financial institutions from which funds are borrowed, the vendors from whom merchandise is purchased, or the government officials who are collecting taxes from the concern. Whatever the form of organization, and whatever the purpose for which precise quantitative information is desired accounting is the device which supplies information as to the various activities of an enterprise: marketing, production, purchasing, personnel, and finance. The information is expressed in such terms as "income from sales," "manufacturing costs," "wages," "interest," "taxes," and "profit."

Non-profit institutions, such as churches, lodges, museums, schools, educational foundations, and hospitals, also use accounting data in controlling their activity. Information concerning dues, fees, subscriptions, membership, sources of income, and causes of outgo—all such data are provided by accounting and are important for control of the economic activities of these organizations. The financial success or failure of a metropolitan art museum or a civic opera company is not, of course the criterion of its social usefulness. Nor is it the purpose of accounting to attempt to measure the social usefulness of institutions. Accounting is not used by non-profit institutions to justify or condemn their existence, but rather to insure the wise administration of the economic goods under their control.

[13] Adapted from C. R. Rorem, *Accounting Method*, pp. 3–9. (Chicago: The University of Chicago Press, 1928.)

Governmental organizations—nations, states, counties, townships, cities—all use accounting information for control of their activities. Accounting data are continually used by public officers to aid in the intelligent solution of such problems as legislative appropriations, tariff schedules, tax rates, executive salaries, etc. Governments also use accounting for the control of private business enterprise, as in the regulation of railroad rates, the control of banking operations, or the supervision of activities of trade associations.

The individual citizen as a consumer of economic goods also relies upon accounting to supply him with information concerning his own affairs. Even the simple problem of administering a household budget may well require some method of accounting, so that the household income may be effectively apportioned among the necessities and luxuries of life—food, rent, clothing, education, and entertainment.

Certain aspects of modern business make accounting of vital importance in the control of a specific enterprise. In the first place, modern business is complex; the operations of a single factory comprise such varied and technical activities as the mixing of chemicals, transportation of materials, assembling of parts, generation of power, testing of finished products, and supervision of workmen. It will often lie beyond the power of the most intelligent business manager to supervise and direct personally the varied processes being carried on under his control. His task is rather to co-ordinate the work of certain technical specialists who are responsible for the varied activities. In the second place, business enterprise is frequently operated on such large scale that its very size would prevent one man from directing it personally. Many enterprises employ thousands of men to carry on their activities. And even if the tasks of all these men were simple enough to be understood by a business manager, it would be impossible for him to maintain direct control over the activities of each employee. In the third place, the geographical areas of enterprise are often so great that peculiar problems of control arise. Many large companies employ salesmen and establish branches which operate in all parts of the world. Even a simple enterprise doing a moderate amount of business must maintain accounting records when the employees are continuously absent from the center of business activity. Other characteristics of modern business could be cited to emphasize the need for

some device to supplement direct personal observation and contact in the control of a given enterprise. Enough have been mentioned to demonstrate that the powers of the individual manager must be multiplied if he is to maintain control over important areas of economic activity. This multiplication of powers may be accomplished through recorded data, properly classified, summarized, and interpreted.

The method of accounting is an application of the quantitative method of scientific analysis, a method which confines itself to those aspects of phenomena which can be measured. Quantitative method is particularly applicable to the measurement of economic transactions, although it has been most fully developed in the natural sciences, where laboratory technique makes it possible to segregate phenomena for continued and accurate observation.

Quantitative method may be subdivided into two basic steps or processes. The first process is *measurement* of the phenomena to be studied. The phenomena may be the heat-producing qualities of certain foods, the tensile strength of metals, the mental capacities of factory employees, or the expenditures of a local government; the phenomena to be measured will vary with the field in which the quantitative method is being applied. The second process is *interpretation* of the data. This process usually involves classification and summarization, followed by the measurement of important relationships between classes and groups of data. The relationships are usually those which can be expressed in such terms as ratios and averages.

Recording is not included as a basic process in the quantitative method. Records are, of course, necessary to the application of quantitative method; in fact, records must be maintained during each phase of its application. Recording, then, is not a single process in quantitative method; it is rather a requirement which must accompany each of the processes, if the data are at all numerous.

There are two main types of quantitative method which may be applied to the analysis of economic phenomena—statistics and accounting. "Statistics" is the broader term, and sometimes the expression "statistical method" is used as synonymous with "quantitative method." Both statistics and accounting, however, may be regarded as applications of the same general method of analysis.

See also:
"The Comptroller Function," page 777.
"The Balance Sheet, the Profit and Loss Statement, and the Budget," page 780.
"Cost-Accounting," page 787.

6. SOME SIGNIFICANT STANDARDS: THEIR MEANINGS AND PURPOSES[14]

1. STANDARDS OF MEASUREMENT

a) *Meaning*

Reference and working standards for measurements of all kinds, including fundamental and derived *standards of measurements* for expressing the quantitative aspects of space, time, matter, energy, and motion, and of their interrelations.

By definition, specification, or material standard, covering, for example, length, area, and volume; mass, weight, density, and pressure; heat, light, electricity, and radioactivity; including for each the quantity, flux, intensity, density, etc.

b) *Purposes*

To aid accuracy in industry through uniform and correct measures.

To assist commerce in size standardization of containers and products.

To promote justice in daily trade through systematic inspection and regulation.

To facilitate precision in science and technologic research through calibration of units, measures, and instruments involved.

2. STANDARD CONSTANTS

a) *Meaning*

Natural standards or the measured numerical data as to materials and energy, known as physical or *standard constants*, that is, the fixed points or quantities which underlie scientific research and industrial processes when scientifically organized.

Mechanical equivalent of heat, light, electricity, and gravitation; specific densities; viscosities; melting and boiling points; heat capacity; heats of combus-

[14] Adapted from Irving S. Paull, J. W. Millard, and Jas. S. Taylor, *Trade Association Activities*, Domestic Commerce Series No. 20, pp. 312–13. (Washington: U.S. Government Printing Office, 1927.)

tion; velocity of propagation of light; conductivities of materials to heat and light; electrochemical and atomic weights; and many similar magnitudes determined experimentally with maximum precision and referred to fundamental standards of measure.

b) *Purposes*

To serve as an exact basis for scientific study, experiment, computation, and design.

To furnish an efficient control for industrial processes in securing reproducible and uniformly high quality in output.

To secure uniformity of practice in graduating measuring instruments, or in compiling tables for standards of quality and performance, and whenever such uniformity is desirable.

To aid laboratory research by reducing errors and uncertainty caused by use of data of doubtful accuracy.

3. STANDARDS OF QUALITY

a) *Meaning*

Specifications for material (by description, sample, or both), known as *standards of quality,* fixing in measurable terms a property or group of properties which determine the quality.

The numerical magnitude of each constituent property pertinent to the quality involved, and specific magnitude in units of measure of such significant factors as uniformity, composition, form, structure, and others.

b) *Purposes*

To secure high utility in the products of industry by setting an attainable standard of quality.

To furnish a scientific basis for fair dealing to avoid disputes or settle differences.

To promote truthful branding and advertising by suitable standards and methods of test.

To promote precision and avoid waste in science and industry by affording quality standards by which materials may be made, sold, and tested.

4. STANDARDS OF PERFORMANCE

a) *Meaning*

Specification of operative efficiency or action for machines and

devices, known as *standards of performance,* specifying the factors involved in terms susceptible of measurement.

Numerical statement of speed, uniformity, output, economy, durability, and other factors which together define the net efficiency of an appliance or machine.

b) Purposes

To clarify the understanding between maker, seller, buyer and user as to operative efficiency of appliances and machines.

To make exact knowledge the basis of the buyers' choice.

To stimulate and measure mechanical progress.

5. STANDARDS OF PRACTICE

a) Meaning

Codes and regulations impartially analyzed and formulated after study and experiment into *standards of practice* for technical regulation of construction, installation, and operation, and based upon standards of measurement, quality, and performance.

Collation of standard data, numerical magnitudes, and ranges of the pertinent factors defining quality, safety, economy, convenience, and efficiency.

b) Purposes

To furnish for each utility a single impersonal standard of practice as a basis for agreement of all interests, clearly defined in measurable terms.

To insure effective design and installation of utilities of all kinds.

To promote safety, efficiency, and convenience in the maintenance and operation of such utilities.

To secure uniformity of practice where such is practicable, and effective alternates in other cases.

See also "Industrial Standardization," page 791.

C. Reliance upon Individual Initiative

Let us suppose an absurd thing. Let us suppose that with existing natural resources, existing scientific knowledge, existing material equipment, and existing labor force, our society were organized with an omniscent benevolent despot at its head. By hypothesis this despot

knows everything; he knows the needs of his people, what goods ought to be produced, how they could be produced most effectively—everything. By hypothesis, this despot would not control society for his own selfish ends; he would control it for the good of the people. By hypothesis, this omniscient benevolent person has power to carry out his wishes. Although we cannot be sure precisely how this omniscient benevolent despot would organize the affairs of his society, we can see that responsibility for this organization is definitely placed. It is quite thinkable that the despot himself will take the initiative in making all decisions as to what shall be produced, where production shall take place, in what kinds of work the various individuals of society shall be engaged, what techniques and materials shall be employed. If he does thus act, if these and all other decisions concerning economic activities are made by him, it is obvious that he bears the responsibility for the planning and guidance of a coherent unified mechanism for supplying wants.

Our society is very different. In some respects our society illustrates the other extreme of ways of organizing to supply wants. We have a society of so-called "individual initiative," in which every individual of sound mind and of mature age has the opportunity and the responsibility of initiating activities. True, the activities of these individuals are in part controlled by formal and informal rules of the game. In large part, however, the matter is left to a competitive struggle. These individuals (acting thus on their own initiative) are enabled to organize social energy for productive purposes through the use of private property. Every individual may have private property rights; and in our exchange society the ownership of property enables the individual to *command* (through exchange) land, labor, and capital—and these he organizes in the productive process. As a means of facilitating his action, contractual relationships have been developed. Within certain broad limits every individual is permitted to enter into all sorts of contracts (agreements enforced through the law and the courts) with others; he has freedom of contract.

We are not at this time in a position to evaluate this way of doing things. That evaluation will come after we have examined at much greater length the operations of our economic order. At this time we are concerned solely with seeing that (*a*) upon the one hand the individual works within an intricate network of institutions, customs, and

attitudes (at the moment we are particularly interested in private property, freedom of contract, individual initiative, and pecuniary competition) which mold and dominate him; and (*b*) upon the other hand, he also actively and consciously adapts his conduct to accord with them and even utilizes them for his own purposes—in particular private property and freedom of contract are devices which the individual may use to carry out the opportunities and responsibilities with which he is vested.

The present section is designed to give a general view of the place of individual initiative in our economic activities and an understanding of the parts played by some of the more responsible agents in our economic order. With this as a background, later sections will deal more specifically with private property, with competition, with social control, and with those devices for the organization of economic activity which we call the forms of the business unit.

The readings in this section[14a] have been selected in the light of these issues:

1. In our society, how is it determined what goods shall be produced?
2. How are our social resources organized for getting these goods produced?
3. What types or classes of persons are in strategic positions with respect to the guidance of economic activity?

1. THE ENTREPRENEUR AND THE GAIN SPIRIT[15]

Perhaps the strongest motive influencing the individual to-day is that of gain. Other things being equal, *we do what pays best*. We take up the specialized work that we find most profitable. If we own a piece of land, we are likely to rent it or sell it for the specialized purpose which offers us the greatest gain. If we are operating a steel mill or a machine shop, we will make the implements that bring the greatest net return. This explains how society's story of raw materials, such as timber, coal, and iron ore, are made into one form of capital goods rather than another. Business men everywhere, not only the owners of factories, but also the owners of farms, stores, railroads,

[14a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 75–76. (University of Chicago Press.)

[15] Adapted from Marshall and Lyon, *Our Economic Organization*, pp. 326–29. By permission of The Macmillan Company, publishers (1921).

mines, and all other business enterprises, are always trying to direct the land, labor, capital, and organization which they control into the production of goods which will give them the greatest gains. They direct productive energy into the channel where greatest profits are found.

The experience of a little town in Ohio during the Great War is illuminating. Before the war there was but one factory in this town. This was an automobile factory and nearly every worker in the town was employed there. The coal from a near-by mine was all used by the same company. All the steel and wood and rubber that were shipped into this town were used to make automobiles. But when the war began a stranger moved to the little city and put up a factory for the manufacture of war munitions. He did this because the government was offering such high prices for these munitions of war that he felt certain he could make good profits. He accordingly felt able to offer high wages to workers—higher than the automobile manufacturer could afford to pay. Before long nearly every man in the locality had left the automobile works and was employed in the munitions plant. These workers had followed the lure of the greatest gain. The owners of the neighboring coal mine also found the munitions manufacturer ready to pay more than they were receiving for coal. They agreed to sell their whole output to the munitions plant. A steel mill from which the automobile maker had been securing steel also received a high bid for steel from the munitions maker, and as a result their output of steel was soon diverted from the automobile shop to the munitions plant. Presently the automobile manufacturer closed his factory. He could not secure the men or materials for manufacture. The social resources upon which he had been relying had been drawn into another form of production by the lure of greater gains. This case well illustrates what we mean when we say that our productive resources are apportioned among our various enterprises on the basis of the comparative gains made in those enterprises.

The entrepreneur bears risks and takes profits.—In large part, then, our productive resources are apportioned—our economic activity is guided—by individuals who command society's resources and who follow the lure of gain. Who are these individuals? They are each and every one of us, for each of us apportions at least his own

work power. There are, however, certain individuals who specialize in apportioning productive resources, who do it on a much larger scale than most of us. These persons, sometimes called *entrepreneurs* or *enterprisers*, are business men who think they see a chance for gain by engaging in certain businesses, and assuming command, through private property rights, not only of their own productive resources but of those of the rest of us.

In effect such an enterpriser says to the rest of us: "I think I see an opportunity. Indeed, I am so sure of it, that I will place my own wealth in the position of first risk and engage in this enterprise. I should like some of you to work for me; you need take no great risk; I shall pay you a definite sum regularly. I should like to borrow land and capital goods from others of you; you also need take no great risk; I shall pay you definite sums regularly. I myself will be the risk taker of this enterprise. If things go badly in making the goods, or if it turns out that I have made a mistake concerning the existence of an opportunity, the rest of you will not lose. As I go along, I shall pay wages to those who work for me, and those who have loaned me land or capital goods will be safe because I shall pledge for repayment not only the things I have borrowed from you, but also my own property which has been put into the enterprise. On the other hand, having taken the risk, I expect also to take all gains which may be left after I have paid wages, and have paid for the use of the land and capital goods and have met other expenses."

It is hard to overestimate the importance of these organizers of production,[16] no matter whether they are operating stores, building railroads, running a farm, conducting a publishing company, or operating a theater. Clearly, if they have real vision and foresight with respect to profitable opportunities; if they are really able to forecast the wishes and wants of society; if then they are able to combine labor, capital, and land effectively, so as to use social energy efficiently, the "right" goods will be abundantly produced and all of us can get goods more easily than we could if social energy were used wastefully and inefficiently. Under such circumstances, the profits which these enterprisers would make might properly be regarded as payment to them

[16] Cf. Henry Clay, *Economics for the General Reader*, American edition, chap. iii.

for undertaking the risks connected with the organization of specialists in our society. On the other hand, if they are short-sighted or use poor judgment in converting social energy into goods, they are likely to suffer a severe financial loss. This fear whips many of them to strenuous work. We must not deceive ourselves with respect to the consequences of a failure of one of these enterprisers. At first glance we are likely to think that an unsuccessful entrepreneur loses money and that is the end of the matter. By no means. Social resources have been misdirected; they have been unwisely used; they are no longer available for wise use; our wants will not be as fully gratified as they would have been had this failure not occurred.

See also "The Services of Competition," page 410.

2. SOME RESPONSIBLE AGENTS[17]

1. *The rôle played by technical experts.*—The making and distributing of goods by the elaborate modern methods requires highly skilled direction. On the technical side the work is planned by, and executed under the supervision of, civil, mechanical, mining, and electrical engineers, designers, industrial chemists, "efficiency experts," etc. These are the men who know how to extract raw materials, refine and manufacture them, devise and operate machinery, organize working forces—in short, the men who know how to secure the principal efficiency of economic effort. By applying the results and the methods of science to the everyday work of the world, they have led the rapid advance in the technique of production of which we feel so proud.

2. *The rôle played by enterprisers.*—But in no country in the world are these technical experts allowed free scope in directing the work of providing material goods. Higher authority is assigned by the money economy to another class of experts, business men who are skilled, not in making goods, but in making money. As an employee of the business man, the engineer must subordinate his interest in mechanical efficiency to his superiors' interest in profitable investment.

[17] Adapted by permission from W. C. Mitchell, *Business Cycles*, pp. 32–37. (University of California Press, 1913. Author's copyright.)

The chief rôle in directing what use shall be made of the country's natural resources, machinery, and labor is therefore played by its enterprisers.

3. *The rôle played by lenders.*—The enterprisers, indeed, do not have unlimited discretion in deciding what use shall be made of the available resources, equipment, and labor. In matters of importance their decisions are subject to review by a higher court. For most business projects require the use of funds borrowed from banks, large capitalists, or from the investing public, and this fact gives the lenders an effective veto power over proposals which do not meet their approbation.

Whenever an enterpriser applies to an individual capitalist to take an interest in some project, to a bank to discount his notes, or to the investing public to buy bonds, he must satisfy the lenders of his ability to keep up the interest and to repay the principal. Even when the applicant can provide collateral security for the loan, and obviously when he cannot, the lender's decision depends largely upon his own judgment regarding the business prospects of the intended venture. To aid their officers in forming intelligent decisions, banks are coming to require applicants for loans to make on standard forms systematic statements of their financial standing and projects. In addition, the banks and the houses which grant mercantile credits subscribe to commercial agencies and maintain credit departments of their own for the purpose of collecting and classifying information about the business standing and prospects of their customers. Similarly, corporations which offer bonds or stocks for sale find it advisable to publish advertisements and circulars setting forth their financial condition, the purposes for which money is being raised, and the anticipated profitableness of the extensions in view. Affidavits from certified public accountants, legal counsel, and consulting engineers are often appended to lend these statements greater force.

The review of the projects of enterprisers by lenders, then, is no perfunctory affair. Nor is its practical influence upon the guidance of economic activity negligible.

4. *The rôle played by government.*—A fundamental difference of principle sets off the rôle played by government in guiding economic activity from that played by business enterprises. While business en-

terprises aim at making money, government aims at securing public welfare.

Notoriously, this broad difference of principle is sadly blurred in practice. Even in the most democratic countries, public welfare is not always the ruling passion of the men elected to office. Besides, public welfare remains so vague a concept as to leave wide room for differences of opinion about the relative value of rival policies proposed for its promotion. Moreover, among the citizens of a money economy the habit of applying pecuniary tests and accepting pecuniary standards gives a strong commercial flavor to their very statesmanship. Finally, government is forced to pursue its social ends largely by business methods. It must count the cost even when it cannot count the gains of what it does in dollars, and by some shift it must raise a money revenue to defray its money outgo. But, after all the necessary qualifications have been made, it still holds true that in dealing with economic problems government keeps closer to fundamental issues than is feasible for business men. Government can consider what needs it is important to satisfy, while business men must consider what market demand it is profitable to supply or profitable to create.

Were this difference of aim the sole difference between the public and private guiding of economic activity, society would probably be organized on the basis of state socialism instead of on the basis of money economy. But there is this further difference, that government is far less efficient in pursuing its aim of social welfare than business enterprise in pursuing its aim of making money. The scope actually accorded to government in managing industry has been affected no less by apprehension of this shortcoming than by appreciation of government's function as the guardian of common interests.

3. THE PROMOTER[18]

The function of a promoter.—A promoter is a man who organizes a new business and sets it going. The business need not necessarily take the form of a corporation. It may be handled as a partnership or a joint-stock company.

The promoter is necessary because the great mass of the funds

[18] Adapted by permission from W. H. Lough, *Corporation Finance*, pp. 154–58, 167–70. (De Bower Elliot-Co., 1909. Author's copyright, 1917.)

used in larger corporate enterprises is passive; that is to say, the owners of investment funds are not primarily engaged in buying and handling business enterprises. They wait until a good proposition is presented to them. The function of the promoter, therefore, is to bring his proposition to the attention of the owners of funds in such a manner as to arouse their interest and confidence and induce them to buy the securities of his new corporation.

"Discovery" of a proposition.—A promoter in handling an enterprise has three separate tasks before him. First, he must "discover" his proposition; second, he must "assemble" it; third, he must "finance" it.

The discovery of a proposition does not mean simply to find it, but includes a thorough investigation into all the surrounding conditions, and the solution in advance of all the difficult problems that are likely to arise in its development. Let us suppose, for instance, that a new invention which looks good on the surface is brought to the attention of the promoter. If he understands his business he will first of all examine critically every point that points toward the invention's success or failure. He will find out whether it is patented and just what features the patent covers. Next, he will consider whether other devices are in use which perhaps accomplish the same purpose as well or nearly as well as the invention. After making sure that the invention is what it purports to be, he will consider the possible markets for the article.

Next, the promoter takes up the cost of manufacturing. He finds out whether new and specially constructed machinery is necessary in manufacturing the invention, and whether any especial skill on the part of laborers is required. He considers the amount of experiment that will be necessary in order to perfect the invention and in addition figures a large amount of extra cost for unforeseen contingencies.

These are only a few of the factors that the promoter would investigate before taking any further action. Their number is sufficient to indicate, however, that any promoter who has a reputation to make or preserve cannot afford to jump hastily at whatever proposition is presented to him. The process of discovery may take a long time, perhaps months or even years.

"Assembling" a proposition.—By assembling a proposition is

meant the process of getting temporary control into the hands of the promoter. If he is dealing with an invention, he assembles the proposition by getting an option on the invention or by making an agreement with the inventor on a royalty basis. In the case of a consolidation of plants or railroads into a new corporation, assembling is frequently much more complicated and difficult. In such a case the promoter may have to get options or arrange the terms of purchase with every plant and perhaps with all the different classes of security-holders involved.

Financing a proposition.—Now we come to the most difficult part of the promoter's work, his financing of the new corporation. No hard and fast rules can be laid down to cover the promoter's procedure.

We may classify the men who spend a considerable amount of their time and energy in promotion into four groups. Let it be clearly understood, however, that this classification does not pretend to be complete.

First come the professional promoters, the men who really do make it their main, and almost their sole, business to hunt for enterprises that promise profits and to finance those enterprises. This type is common in fiction, but rare in real life. So far as the writer recalls, he has met only one man who could be put in this class, a tall, lank, fervent individual with a persuasive air.

The second class consists of lawyers and bankers in small communities. Such men have exceptional opportunities to inform themselves as to local conditions; they frequently take hold of some local enterprise, such as a steam or street railway, secure the assistance of experts for investigation and carry through the proposition to success. Still more frequently, however, so far as the writer has observed, such men underestimate the difficulties of the problem; they take it up with enthusiasm but are forced either to drop it or to call in men of wider experience.

The men to whom they generally turn constitute the third class of promoters, namely the large bankers and brokers. The amount of promotion work performed by such men is limited and they usually confine their active participation—except for advice—to the financing of such enterprises as they take up. Mr. J. Pierpont Morgan stands out as the most prominent example of this class.

The fourth class—and this is a recent important development—consists of engineering firms engaged in construction work of various kinds. Certain large engineering concerns have established a wide reputation for success in operating street railroads, water works, electric lighting plants, and so on. These firms naturally have built up a large and well-equipped staff of experts in those fields. As the staff is expensive, it becomes a pressing problem to keep them profitably employed all the time. In the effort to solve this problem such firms have drifted into the custom of taking up new enterprises of merit and performing the work of promotion themselves. Their prime object in so doing is to employ their own engineering talents and the abilities of their staff to the best advantage. Incidentally, of course, they have no objection to securing some of the other returns that naturally follow from successful promotion.

A further discussion of individual initiative as guided by the gain spirit may be found in the final chapter of Part III.

D. The Institution of Private Property

In our study thus far we have come to understand in a general way that the institution of private property is connected with individual initiative in two main ways. Upon the one hand, the individual sees in private property one of his largest motives or incentives to economic activity; working through the gain spirit, it spurs him on into activities desired by society and it lashes him back from activities not desired. Upon the other hand, through private property the individual is enabled to exercise control of economic activity; through exchange and through the use of contracts, property enables him to command the use of instruments of production. Since private property is utilized in such important ways, it has quite naturally come to be regarded as one of the chief organizing devices of our society.

Now, in as intricate and mutable a society as ours, it will be well if the important organizing devices are capable of change, flexibly adjustable to varied conditions, and yet inherently tough and sturdy. The institution of private property, while far from perfect as an or-

ganizing device, measures up to these requirements fairly well; and (what is vastly important) society can, if it but chooses, make it measure up much better.

If the following issues[18a] are kept in mind, the usefulness of the readings in this section will be increased:

1. What are the chief elements in the content of private property today? What are its chief attributes?
2. What evidence is there that private property is flexible and adjustable to varied conditions?
3. What outstanding types of justification of this institution have been advanced?
4. What is the economic function of contract?
5. What seem to be the dominant trends of the present day with respect to private property?

1. PROPERTY, OWNERSHIP, POSSESSION[19]

1. *Conception of property.*—There is, perhaps, nothing more difficult than to give a precise and consistent meaning to the word "property." When we speak of a man of property, we think, perhaps, in the first instance, of tangible, material things which belong to him—land and houses, horses and cattle, furniture and jewelry and pictures—things which he may use or destroy (so far as that is physically possible); from which he may exclude others; which he may sell or give away or bequeath; which if he has made no disposition of them will pass on his death to persons related to him.

But we shall find that our conception of property relates to many things which are not tangible or material. Our man of property may be an author or a patentee, and we shall hardly be able to say that his copyright or patent-right is not part of his property, or even to avoid speaking of his ownership of the copyright or patent. He will have debtors; his bank is a debtor to him for the amount standing to his credit; his investments of money are claims to receive payment from the State or from corporations or individuals. Such debts and claims are not rights over any specific tangible objects; they are mere rights against the State, or the corporation, or the person liable to pay. Yet

[18a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 75–77. (University of Chicago Press.)

[19] Adapted by permission from W. M. Geldart, *Elements of English Law*, pp. 113–20. (Henry Holt & Co. Williams & Norgate.)

these rights are transferable, and will pass on his death to his representatives. We cannot exclude them from our notion of property or deny that in a sense, at any rate, he is the owner of them.

On the other hand, his "property" clearly does not include all his rights. To say nothing of his general right of liberty or reputation, his rights as a husband or a parent are not proprietary rights, nor is his right to recover damages for personal injury or defamation; but we may include among proprietary rights the right to recover damages though unliquidated (i.e., of uncertain amount until settled by a judge or jury), for breach of contract, or, probably, even for injury to his property.

Generally speaking, we shall include under the notion of a man's property in its widest sense all rights which are capable of being transferred to others or being made available for payment of his debts, or of passing to his representatives on his death.

2. *Ownership and possession.*—Turning to rights over tangible things, we must notice the distinction between ownership and possession. The owner of a thing is the person who has, in the fullest degree, those rights of use and enjoyment, of destruction, and of disposition, which have been mentioned above—subject, of course, to the general rules of law which protect the rights of others, and subject to certain limited rights which he or his predecessors may have created in favor of others. The owner of a pistol is none the less owner because the law prohibits him from discharging it in a public highway; the owner of a field does not cease to be owner because the public or a neighbor has the right to use a footpath across it.

The essence of ownership, then, is that it is a right or an aggregate of rights. Possession, on the other hand, is primarily a matter of fact. If the owner of a watch is robbed of it by a thief, the owner's rights as rights remain intact; the thief acquires no right to the watch as against the owner. But the owner's possession, and with it his actual power to exercise his rights, is for the time being gone; he must recover the watch—as he may even lawfully do by his own act—before he can be said to be again in possession of it. So, too, the owner of land may be out of possession, and another without right may be in possession. In this case the forcible retaking of possession is prohibited under penalties by statute; but the retaking, though punishable, is none the less effective to restore the possession.

The cases of the thief and squatter have been taken as the clearest instances of possession acquired without any right whatever. But possession may lawfully be acquired and yet be unaccompanied by ownership. An owner who delivers a horse or a bicycle by way of loan or hire to another parts with the possession of him, but does not cease to be owner. The same is true of one who delivers articles to another in order that the latter may bestow his labour upon them. Such voluntary transfers of possession are called bailments, and the person who so acquires possession is a bailee of the goods.

So far we have thought of ownership and possession as sharply distinguished—the one a matter of right, the other of fact. Nevertheless, possession is a fact which has an enormous legal significance, a fact to which legal rights are attached. In the first place, actual possession is evidence of ownership, and, except in cases where ownership is based on a system of public registration, it is hard to see how any ownership can be proved, otherwise than by going back to some prior possession.

In the second place, possession is not merely evidence of ownership, but (subject to the rights of the owner) is itself and for its own sake entitled to legal protection. The finder of goods is entitled—except only against one who can show himself to be the owner—to legal protection against all the world.

Lastly, we may notice that even wrongful possession, if continued for a certain length of time, matures into what, for practical purposes, is indistinguishable from ownership. A wrongful possession of land for twelve years, of goods for six years, destroys the owner's right to recover his property by action and, at least in the case of land, his right to retake possession.

2. THE ATTRIBUTES OF PROPERTY[20]

The right of property, says Art. 544 of the *Code Napoleon,* is the right to enjoy and dispose of things in *the most absolute fashion.* Although this definition has ceased to be altogether true—for the law of property is nowadays subject to ever-increasing restrictions—it brings into sharp relief that ownership really is, an absolute right: (1) ab-

[20] Adapted by permission from Charles Gide, *Political Economy,* 466–71. (D. C. Heath & Co., 1913.)

solute, in that it embraces the sum total of the satisfactions which may be obtained from a thing, including even the stupid satisfaction of destroying it; (2) absolute, in that it is not limited by time, or at any rate is limited only by the length of life of the object. *Perpetuity* and *free disposal* are, then, the two characteristics of the right of property.

1. *Perpetuity.*—When the right of property has for its object goods which perish in consumption, or which last but a short time, perpetuity is of no great economic interest, since it is not actually realised. But when the object appropriated is perpetual in its nature or at least very long-lived, the right of property appears in its full force and with all its consequences.

2. *Free disposal.*—The other essential attribute of the right of property is, as we have said, the right of *free disposal:* the right, as the French Code defines it, to enjoy and dispose of things in the most absolute fashion.

But this right "to dispose of a thing at will," which gives ownership the essentially absolute character without which we should not recognise it, did not always exist. It was only gradually that the idea of ownership widened, passing through the same progressive stages as the object of ownership.

The following, so far as we are able to conjecture, is the order in which the right of private ownership acquired its essential attributes:

(1) Probably the first right of property was that of *exploiting one's possessions,* i.e., turning them to account by the labour of others —slave labour in former times, the labour of the free wage-earner today. This was the most "noble" attribute, since it absolved the owner of property from personal labour.

(2) The right of *gift* seems to have been one of the earliest modes of disposing of wealth—at least in the case of "movable" objects—prior even to the right of sale.

(3) The rights to *sell* and to *let* do not seem to have appeared till much later—at least in the case of immovable property. Aristotle, in the fourth century B.C., declared that these were necessary attributes of the right of property, but does not speak as if they were at that time generally recognised. There were reasons enough, indeed, why they should not be. So long as property was vested in the family and was under the seal of religious consecration—which was the characteristic

of property in antiquity—alienation was not possible: it constituted an impious act on the part of any member of the family. Further, as division of labour and exchange did not yet exist, each family was self-sufficient and as movable wealth was rare—each man kept his own, sometimes even taking it to his tomb with him—sale could only be an exceptional and abnormal act. Thus, when it first appears, we find it compassed with extraordinary solemnities: it is a sort of public event. The *mancipatio*, for instance, had to take place in the presence of five witnesses, representing the five classes of the Roman people.

(4) The right *to bequeath*, i.e., to give by will, which has always been considered the most important attribute and the crowning feature of the right of property, prolonging as it does this right beyond death, was still slower in making its appearance.

3. FORMS OF WEALTH AND OF PROPERTY[21]

FORMS OF WEALTH

- Wealth
  - Real Estate
    - Land
      - Productive land
        - Crop land, grazing land, timber land, mining land, hunting land, fisheries
      - Ways of transit
        - Railways, roadways, waterways, parks
      - Building land
    - Land improvements
      - Buildings
      - Improvements on highways
        - Overhead
        - Underground
        - Surfacing
        - Bridging
      - Minor
  - Commodities
    - Raw Materials
      - Mineral
      - Agricultural
      - Manufactured
    - Finished products
      - Consumable
        - By being burned
        - By being eaten or drunk
        - By being otherwise used
      - Durable
        - Mechanical devices
        - Animals
        - "Hard money"
        - Clothing and jewelry
        - Furniture and works of art
        - Reading matter
        - Minor
  - Human Beings
    - Slaves
    - Free

[21] Taken by permission from Irving Fisher, *The Nature of Capital and Income*, pp. 7, 37. (The Macmillan Co., 1906.)

FORMS OF PROPERTY RIGHTS

- Property Rights
  - Complete (Fee Simple)
  - Partial
    - To services cut longitudinally
      - Rights in common
      - Rights to different usufructs
      - Partnership rights
      - Joint stock shares
    - To services cut transversely
      - Lease
      - Reversion
      - Patent and copyright
    - Rights to definite parts of services
      - Promises
        - Bonds
        - Private notes
        - Bank notes
        - Bank deposits
      - Orders
        - Checks, drafts, and bills of exchange
        - Irredeemable paper money
    - Minor and indefinite
      - Good will and custom
      - Taxing power

4. THE VARYING CONTENT OF THE TERM PROPERTY[22]

One of the mistakes oftenest committed is that of supposing that the same name always stands for the same aggregation of ideas. No word has been the subject of more of this kind of misunderstanding than the word property. It denotes, in every state of society, the largest powers of exclusive use or exclusive control over things (and sometimes, unfortunately, over persons) which the law accords, or which custom in that state of society recognizes; but these powers of exclusive use and control are very various and differ greatly in different countries and in different states of society.

For instance, in early states of society, the right of property did not include the right of bequest. The power of disposing of property by will was in most countries of Europe a rather late institution; and long after it was introduced it continued to be limited in favor of what were called natural heirs. Where bequest is not permitted, individual property is only a life interest.

Then, again, in regard to proprietary rights over immovables (the principal kind of property in a rude age), these rights were of very *varying extent and duration*. By the Jewish law property in immova-

[22] Adapted by permission from J. S. Mill, "Chapters on Socialism," *Fortnightly Review*, XXXI (1879), 526–30.

bles was only a temporary concession; on the Sabbatical year it returned to common stock to be redistributed; though we may surmise that in the historical times of the Jewish state this rule may have been successfully evaded. In many countries of Asia, before European ideas intervened, nothing existed to which the expression *property in land*, as we understand the phrase, is strictly applicable. The ownership was broken up among several distinct parties, whose rights were determined rather by custom than by law. In mediaeval Europe almost all land was held from the sovereign on tenure of service, either military or agricultural.

Again, if rights of property over the same things are of different extent in different countries, so also are they exercised over *different things*. In all countries at a former time, and in some countries still, the right of property extended and extends to the ownership of human beings. There has often been property in public trusts, as in judicial offices, and a vast multitude of others in France before the Revolution; there are still a few patent offices in Great Britain, though I believe they will cease by operation of law on the death of the present holders; and we are only now abolishing property in army rank.

We thus see that the right of property is differently interpreted, and held to be of different extent, in different times and places; that the conception entertained of it is a varying conception, has been frequently revised, and may admit of still further revision. It is also to be noticed that the revisions which it has hitherto undergone in the progress of society have generally been improvements. When, therefore, it is maintained, rightly or wrongly, that some change or modification in the powers exercised over things by the persons legally recognized as their proprietors would be beneficial to the public and conducive to the general improvement, it is no good answer to this merely to say that the proposed change conflicts with the idea of property. The idea of property is not some one thing identical throughout history and incapable of alteration.

5. THEORIES OF PRIVATE PROPERTY[23]

The earliest theory of private property as found in some of the Roman writers is *the occupation theory*. The doctrine that property

[23] Adapted by permission from E. R. A. Seligman, *Principles of Economics*, pp. 131–34. (Longmans, Green & Co., 1905.)

belongs of right to him who first seizes it is, however, one that can apply, if at all, only to the earliest stages of development. Where no one has any interest in the property, no one will object to the assertion of a claim by a newcomer. When property is without any discoverable owner, we still today assign it to the lucky finder. The occupation theory may explain how the present legal title to certain forms of property originated; it cannot serve as a justification of private property, except in the rare case of previously unoccupied or unutilized wealth. The mere fact that a person has seized a thing is no reason why he should retain it.

The next doctrine was *the natural rights theory*. Private property, so we were told by the philosophers of antiquity and the publicists of the later middle ages, is a natural right, a part of the law of nature. It will at once be asked, however, what is denoted by nature? The great philosophers of antiquity upheld private property in slaves as a natural right. Much of what we today consider natural, our descendants will deem unnatural. Our conception of nature in this sense is essentially ephemeral and mutable.

Driven from this position, the natural rights school took refuge in *the labor theory,* and maintained that the real title to private property is derived from the toil and trouble experienced in creating it. Surely, it will be said, a thing belongs of right to him who produces it. But at once comes the reply: no one has created the land. As a consequence, we find thinkers of all ages, from Phaleas of antiquity to the disciples of Henry George today, who contend that private property in land is unjust, while maintaining that private property in everything else is defensible. These critics, however, overlook the fact that the difference between land and so-called labor products is in this respect, at all events, one only of degree, because nothing is the result of individual labor alone.

Since, therefore, neither occupation, natural law nor labor gives an indefeasible title to private property, some philosophers were led to frame the so-called *legal theory* of private ownership which is in essence that whatever is recognized as such by the law is rightfully private property. Obviously, however, this is not an economic doctrine. Good law may be bad economics. The law generally follows at a respectful distance behind the economic conditions, and adjusts itself

gradually to them. The legal theory tells us *what* property is, not *why* it is, nor what it should be.

Thus we are finally driven to *the social utility theory.* This is really implied in the preceding theories and supplies the link that binds them all together. If we allow the individual to seize upon unoccupied wealth, if we recognize the existence of certain rights in what are deemed to be the products of labor, if we throw the mantle of the law around the elements of private property—in every case society is speaking in no uncertain voice and permits these things because it is dimly conscious of the fact that they redound to the social welfare.

6. A CASE FOR PRIVATE PROPERTY

A[24]

First and foremost, supreme, is a group of advantages bearing upon *the production of wealth,* arising from the superior activity, the sterner energy, the greater care in the use of tools, machinery, and plant, the saving of waste in materials and products, which, it is credibly alleged, belong to work done for an immediate individual reward, as compared with that done by him who only finds his interest or feels his duty as a member of a large body.

The second advantage of private property is that it sustains, fosters, and continuously develops, in mankind, that *care for a distant future,* that sense of responsibility for a provision for the young (beyond the mere period of nursing), which not only clearly and by an almost infinite interval, distinguish our race from the brute, but which become the object of the noblest exertion and sacrifices, the spring of the most heroic motives and impulses of which men are capable; in which, indeed, may be said to lie the special cause of man's progressive advancement, in mind, in character, in powers, and in arts, from the lowest to the highest; which, in a word, hold the secret of civilization.

The third advantage which we attribute to private property is that, through the foregoing sense of responsibility for provision for the young during a more or less distant future, it brings into operation the single force which has the virtue *to check the wanton, senseless,*

[24] Adapted by permission from F. A. Walker, *Discussions in Economics and Statistics,* II, 409–10. (Henry Holt & Co., 1899.)

brutal increase of population, amid squalor and hunger—the sure result of which is the degradation of the species, and the speedy loss of the richest and ripest fruits of time and experience.

B[25]

The moral advantage of private property over Communism is that it makes the private person think of his life as a whole, and realize his responsibility for his actions. In a society whose economic organization is at all developed, most property consists, not in rights to the enjoyment of things, but in rights to services; the power to make men act in certain ways. This power, it may well be contended, is as essential a part of what makes individuality in life as is the possession of objects.

But something else can be said for private property in the means of production. The argument may be put in some such way as this: It may be true that all productive work is co-operative and that, therefore, no wealth is produced by individuals in isolation but it does not follow that the part played by different individuals is the same or of equal value. Co-operation is the combining of different wills and different minds, and all deliberation and contrivance comes originally from individual minds. Efficient production is only possible if encouragement is given to originality and invention in individuals as much as to the co-operation between all the members of society. It may be true that power over and control of other men is liable to abuse, but it is also an essential instrument in achieving anything of note in combined effort. If private property gives men the power of directing others in the work of co-operative production, that is no evil but a manifest good if that power is in the hands of those who can use it best. Further, while it may be true that we cannot divide up wealth into parts and say this part was created entirely by this man and this by that, it does not follow that we cannot estimate the relative importance of the parts played by different men. On the contrary, a man's income does roughly express the value which society puts upon his services, and the money a man makes is a fair criterion of his capa-

[25] Adapted by permission from A. D. Lindsay, "The Principle of Private Property," in *Property, Its Rights and Duties,* pp. 73–77. (Macmillan & Co., Ltd., 1915.)

bility to use profitably the power over other men's lives which the possession of property gives. Such a criterion may not be infallible. No doubt it is not, but it is a better criterion than any other which can be substituted for it.

C[26]

For society, and in furtherance of civilization, I, Private Property, assert that I have performed these services, to wit:

First, I have rendered the fundamental conditions of social and industrial life safe and secure. Before I came into my own, the power to seize and hold summed up the ethics of ownership. Energies that might have gone into more productive employments were used in defending one's own or in appropriating one's neighbor's. But I established and secured social sanction and universal respect for the right of possession.

Second, the security thus afforded has caused the energies of men to be diverted from the acquisition to the production of wealth. It has led to the utilization of natural resources, and has provided opportunity for the use of long-continued and consistent industrial policies which have caused material goods to increase verily a hundred fold.

Third, such security has furnished an incentive to man as a worker to utilize his productive capacities to the full. It has caused him to sow, because it has promised that he, and not another, should reap. It has led him to sacrifice immediate gain in establishing new processes and in devising new instruments of production to the end that the earth might be crowned with abundance.

Fourth, I plead innocent of the charge of having favored a privileged "leisure class," upon whom I have showered plenty that has been wasted in riotous living. It is true that I have conferred wealth upon a few. But these few I have not particularly favored. I have chosen them for highly important and extremely dangerous social service. I have assigned to them the task of experimentation in consumption. Whatever bad they have found they have discarded. The good that they have discovered has in time been made the property of the masses. They are the vanguard of my army which is engaged in

[26] "My Apology," by P. Property. Taken by permission from W. H. Hamilton, *Current Economic Problems*, pp. 866–68. (The University of Chicago Press, 1915.)

raising the standard of living. The goods supplied to them are not rewards; they consist only of the laboratory materials necessary to the work which they are doing. Witness their suffering, their costs, and you can appreciate the heroism which makes them willing to serve society in so dangerous and important an undertaking. The extent to which, through their pioneer service, the formerly rigid boundaries of consumption have been extended attests my wisdom.

Fifth, I have greatly increased the product of industry by the use of vast stores of capital. The economic inequality which I have perpetuated has been the cause of the existence of so fruitful a fund. For its bulk has come from the very large incomes whose source I am. The savings which become the capital that turns the wheels of our mills, runs our machines, and speeds our trains across the continent on their missions of service are possible only because of me. And, but for the security which I offer, the investment of these savings would be impossible.

Sixth, I supply the people with abundance and contribute to the fullness of their lives. The security which I have brought about has almost eliminated risks. The result is decreased costs, which I generously offer to the public in decreased prices. The long-time productive operations, the improvements in technique, and the cumulative investment of capital, which I have brought about, confer the favors of plenty, variety, and cheapness upon all sorts and conditions of men. My aristocratic methods have been mere devices for securing democratic ends. I have forced my owners to use me productively. I have made them stewards of the commonweal.

Seventh, I have led society in its development to higher and higher planes. Out of my abundance they have been able to satisfy more and more of their material wants. The certainty with which I have endowed the satisfaction of the necessary material wants has enabled those who choose to give of their time, energy, and means of the immaterial things of life. Our culture, with its wide horizon and its varied content, is my handiwork. That civilization is not coarse and material and brutal is my doing.

Eighth, I have prevented a passing sentimentalism from sacrificing these more permanent values to the passing fancy of the moment. I have, at the cost of much misunderstanding and malignant criticism,

prevented the wealth that was needed for a richer life for the generations of the future from being wasted in satisfying the immediate wants of a few surplus individuals who promised no contribution to culture. I have preferred to have such wealth used in enlarging capital, thus making for bounty of goods, and in social experimentation whose end was to lead men to richer and fuller life. I have seen clearly that a deficiency of human life could easily be supplied within a generation, but that a deficiency in capital can never be made up; that cumulatively it becomes greater as the years pass; and that it must deny life to many yet unborn and rob others of comforts which otherwise would have made their lives less vain and hollow.

Ninth, I have proved myself the custodian of peace and have laid the foundations of a world-wide Christian community. The system of vested interests with which I have surrounded labor and capital has done more for the cause of peace than all other agencies combined. For I have increased many fold the costs to all classes of engaging in war. The world-wide industrial system which I have wrought is more powerful than all armaments combined in protecting a state against the encroachments of another state and it contributes more to nation's understanding of nation than the whole world-wide system of diplomacy. My success has not been complete, but that merely makes my continued presence and activity all the more necessary.

I would not detract one whit from the good intentions of my malefactors. I bear them no malice. My only plea is that I be judged according to my fruits. I am done.

7. THE POSITION OF PROPERTY IN AMERICA[27]

The fact is that private property in the United States, in spite of all the dangers of unintelligent legislation, is constitutionally in a stronger position, as against the Government and the Government authority, than is the case in any country in Europe.

This may seem a startling proposition; but I think a very brief glance at the known facts of history will be sufficient to support and sustain it.

[27] Adapted by permission from A. T. Hadley, *Undercurrents in American Politics*, pp. 38–56. (Yale University Press, 1915); and "The Constitutional Position of Property in America," *Independent*, LXIV (1908), 834–37.

Down to about the thirteenth century the system of land tenure in every country in Europe was a feudal one. It was based upon military service. The majority of those who wanted to cultivate the soil were unable to protect themselves against the dangers of war. In the absence of an efficient protector or overlord no amount of industry was effective and no large accumulation of capital was possible. The services of the military chief were indispensable as a basis for the toil of the laborer or the forethought of the capitalist. It was the military chief, therefore, who enjoyed not only the largest measure of respect, but the strongest position under the law. As the conditions of public security grew better, these things changed. From the fourteenth century to the nineteenth Europe has witnessed the gradual substitution of industrial tenures for military tenures, the gradual development of a system of property law intended to encourage the activities of the laborers and the capitalists, rather than to reward the services of the successful military chieftain. But down to the end of the eighteenth century this new sort of private property represented a superadded element rather than an integral basis of the constitution of society. And even the developments of the last hundred years in constitutional law and industrial activity have not been able to obliterate a certain sense of newness when we contrast the position of the aristocracy of wealth with that of the aristocracy of military rank.

In the American colonies, on the other hand, where the public law of the United States first took its rise, conditions were wholly different. People wanted no military chieftain to protect them, no overlord to rule them. There was plenty of land for all, plenty of opportunity for the exercise of labor and the use of capital. That man did the most for society who worked hardest and saved most. Under such circumstances the laws were so framed and interpreted as to give the maximum stimulus to labor and the maximum rights to capital. There was no military aristocracy which stood in the way.

There were, furthermore, certain circumstances connected with the adoption of the Constitution of the United States which provided for the perpetuation of this state of things—which made it difficult for public opinion in another and later age, when property holding was less widely distributed, to alter the legal conditions of the earlier period.

A large majority of the members of the Constitutional Convention of 1787 were men of substance; a considerable minority were men of wealth. This is of itself sufficient to account for the general tone of the Constitution on matters of property right. But there are certain clauses in that instrument which have been even more effective in securing the property holders against adverse legislation than the Convention itself intended or expected. It was in the first place provided that there should be no taking of private property without due process of law—a constitutional provision which prevented the legislature or executive, either of the nation or of the individual states, from taking property without allowing judicial inquiry into the public necessity involved, and without making full compensation even in case the result of such inquiry was favorable to the government; and it was further provided, by another equally important clause in the Constitution, that no state should pass a law impairing the obligation of contracts.

No man foresaw what would be the subsequent effect of these provisions in preventing a majority of voters, acting in the legislature or through the executive, from disturbing existing arrangements with regard to railroad building or factory operation until the railroad stockholders or factory owners had had the opportunity to have their case tried in courts. They indirectly became a powerful means of establishing the American courts in the position which they now enjoy as arbiters between the legislature and the property owner. For whenever an act of the legislature violated, or even seemed to violate, one of these clauses, it came before the court for review; and in case the court found that such violation existed, the law was blocked—rendered powerless by a dictum of the judges declaring it unconstitutional.

Why was not the constitution amended as time went on? Why did the intensely democratic America of the nineteenth century rest satisfied with constitutional provisions regarding property rights, which were devised by representatives of an aristocratic society in the eighteenth, under circumstances which strengthened the hands of the conservatives?

The first cause for this persistence of property right is to be found in the land policy of the United States. The method adopted in the

disposal of the public lands promoted democracy. Side by side with this effect, and in curious contrast to it, was an equally marked effect in promoting industrial conservatism. The immigrant who settled in the western states was offered two things: the vote, and the chance of becoming a landowner. The opportunity to own farms in freehold made ambitious settlers conservative.

The control of the government over corporations was weakened, and the rights and immunities of the property holders were correspondingly strengthened, by two developments of constitutional law whose effect upon the modern industrial situation may be fairly characterized as fortuitous. One of these was the decision in the celebrated Dartmouth College case in 1819; the other was the passage of the Fourteenth Amendment to the Constitution of the United States in 1868.

I call their effect fortuitous, because neither the judges who decided the Dartmouth case, nor the legislators who passed the Fourteenth Amendment, had any idea how these things would affect the modern economic situation. The Dartmouth College case dealt with an educational institution, not with an industrial enterprise. The Fourteenth Amendment was framed to protect the negroes from oppression by the legislature. It is doubtful whether a single one of the members of Congress who voted for it had any idea that it would touch the question of corporate regulation at all. Yet the two together have had the effect of placing the American industrial corporation in a constitutional position of extraordinary vantage.

In 1816 the New Hampshire legislature attempted to abrogate the charter of Dartmouth College. Daniel Webster was employed by the college in its defense. His reasoning so impressed the members of the court that they committed themselves to the position that a charter was a contract; that a state, having induced people to invest money by certain privileges and immunities, could not at will modify these privileges and immunities thus granted.

Again, by the Fourteenth Amendment to the Federal Constitution the states were forbidden to interfere with the civil rights of any person or to pass discriminating laws which should treat different persons unequally. This amendment, passed just after the close of the Civil War, was intended simply to protect the negro; to prevent the south-

ern states which were in the act of being readmitted to the Union from abridging the rights of the blacks. A number of years elapsed before the probable effect of this clause upon the constitutional position of industrial corporations seems to have been realized. But in 1882 the Southern Pacific Railroad Company, having been, as it conceived, unfairly taxed by the assessors of a certain county in California, took the position that a law of the state of California, taxing the property of corporations at a different rate from that of individuals, was in effect a violation of the Fourteenth Amendment to the Constitution, because a corporation was a person and therefore entitled to the same kind of treatment as any other person. This view, after careful consideration, was upheld by the federal courts. A corporation, therefore, under the law of the United States, is entitled to the same immunities as an individual; and since the charter creating it is a contract whose terms cannot be altered at the will of the legislature which is a party thereto, its constitutional position as a property holder is much stronger in America than it is anywhere in Europe.

8. THE FUTURE DEVELOPMENT OF PRIVATE PROPERTY[28]

We notice movements actually going on which take five directions, all of which are destined, as those responsible for these movements think, to improve the institution concerned, namely:

I. An increase in the mass of free goods.
II. A restriction of the extent of private property and corresponding extension of public property.
III. A development of the social side of private property.
IV. An extension of private property along certain lines: development of rights akin to private property.
V. Changes in the modes of acquisition of private property.

I. These free goods are very generally intellectual goods, ideas to which we fall heir with the expiration of specific pieces of intellectual property.

II. In regard to the extension of public property, illustrations readily occur. Public pleasure and playgrounds are examples. Natural wonders, historical scenes, etc., fall under this head; for example,

[28] Adapted by permission from R. T. Ely, *Property and Contract in Their Relation to the Distribution of Wealth*, I, 340–46, 361–94. (The Macmillan Co., 1914.)

Niagara Falls. Places of historical interest and many beautiful pieces of property ought to be public property and not private. Forests come under this head.

III. The present movement appears to be along the third of these lines, manifested in the increasing public control exercised over so-called public utilities, railways, gas works, etc. In the case of water-supply the main movement in the United States is for public ownership and there is clear indication of a purpose on the part of the American people to hand over to public ownership that whole class of undertakings which we call natural monopolies—those lines of business in which competition is excluded by the nature of the case; that is, permanent successful competition—provided control as opposed to public ownership does not prove successful.

IV. The fourth line of development is the extension of private property and the development of rights akin to property. Now this would seem to contradict the second line of development, but the apparent contradiction here is after all not a real contradiction because the development of private property to which reference is made is along new lines.

We need a development of private property sufficiently firm and strong to protect individuals who come into conflict with private corporations. Numerous illustrations of virtual invasions of property rights by powerful corporations can easily be cited. One of these is through false report of earnings, thus inducing individuals to make investments, getting their money from them under false pretenses. Note further the abuse of the interests of minority holders and "outside" interests.

But the author has in mind still another matter—the relations existing between persons and property, which show especially the necessity of a development of personal rights with pecuniary significance. First of all, let us think of the *right of a person to the protection of the valuable economic powers which he has,* those powers of pecuniary significance which are wrapped up in the natural person—intellectual powers and physical powers; the right to the strength of his arms against needless mutilation by transportation companies of all sorts, manufacturing companies, unscrupulous employers; a right finding one expression in an employers' liability to correspond with

the liability of those who damage valuable material property; that is, responsibility for damages of a pecuniary significance to the person.

We find also in process of evolution *the right to be well born,* to be born under favourable conditions. This is what tenement house laws mean, what sanitary laws mean—the right to a home under sanitary conditions; the right to a development of the powers of body and mind. Such a right is secured in part by our public schools and compulsory education. Laws shortening the length of the working day or week may also be regarded from the point of view of the right of children to be well born.

And what about the *right to an assured income?* It is certainly as important a right as could be developed; there is some movement in this direction. How far is it desirable to go in respect to this?

The right to reputation is also a right of this character and a right not well developed, although the theory of the law is that this right should be secured and we have some protection. It is difficult to secure this right without limiting free discussion and free speech.

V. We take up now the fifth line of development and deal with *modifications in the modes of acquisition of private property.*

It is sufficient for present purposes to call attention to the pronounced self-conscious efforts of civilised society to make it easier to acquire property through labour. This movement is one of the great dominant tendencies of our age, and never in earlier centuries has the world seen anything like it. Even a catalogue of existing measures would require much space. We have education in all its phases, protective labour legislation, modern industrial insurance, improved dwellings, and numerous other measures which will occur to the intelligent reader.

What is the conscious social tendency with respect to speculative gains? We can see when we review the whole ground—although it may surprise those who have not done so—that there is a clearly marked tendency unfavourable to speculative gains, including chance gains or, as they are technically called, gains of conjuncture.

We observe an increasingly severe inspection of banking business throughout the world and it is, in part, with a view to cutting down speculative gains. Publicity of corporate accounts tends in this direction. Speculation finds a considerable field in secrecy of accounts and

in false accounts. In the accounts of monopolies, especially, the tendency of unregulated private management is to cut down apparent gains.

We find a movement somewhat antagonistic to profits in the desire to restrict and regulate the amount received by capital.

We find also a tendency to reduce the gains of monopolies to what are regarded by legislatures and courts as fair returns to capital and enterprise.

Finally, we have efforts to cut down the private receipts of the rent of land. Apart from the agitation of opponents of landed property, we have a pronounced movement in favour of the public ownership of natural treasures and water-power.

We come next to modifications in the treatment of gifts and inheritances. This is one of the great world movements of the age which attracts inadequate attention at the present time. We not only have the taxation of gifts and inheritances, but we have a regulation apart from taxation.

A further discussion of private property may be found in the final chapter of Part III.

E. Competition as an Organizing Device

Individual initiative, using private property as an organizing device is competitively fitted into the economic process.

What is competition? Everybody knows; nobody knows. To a person with one intellectual background it means one thing; to another with a different background it clearly means another. The widely divergent definitions and characterizations current make one inquire whether the persons concerned are talking of the same thing. If they are, they seem to have very different points of view or very different purposes in making their analyses.

Perhaps we do not need to strive for an exact definition at the outset. Perhaps we shall be able to consider the subject intelligently without ever formulating a precise definition. We could scarcely define life, and yet we live and talk with some intelligence concerning life. The same situation may obtain for competition.

It is clear that we are not primarily interested in competition as a philosophical-biological concept. We are concerned with economic competition. Further, since we are studying the structure and functioning of industrial society, we are justified in considering economic competition primarily in its organizing capacity.

There can be no doubt that in a very real sense competition—pecuniary competition—is another organizing device in our industrial society. It assigns persons to their parts; determines what forms of organization shall survive; designates what ranges of industries and what plants within an industry shall come to the front; accounts for the rise and decline in economic importance of territories, cities, and markets; decides what technical processes and what marketing methods shall live; all this and more. Perhaps its main medium in working out these matters is price, using that term in a very broad sense, although in certain cases quality and service have been emphasized.

Certain points in connection with the foregoing statements should be brought clearly into consciousness. (1) It is not alleged that competition, especially pecuniary competition, is an organizing force properly applicable in all conditions and circumstances. On the contrary, there are clearly considerable areas in our industrial relations where some other organizing force, possibly that of *authority*, should be used. (2) Even where competition does act as an organizing force it cannot be maintained that it is the only possible one. Custom, also, to cite but one case, is an organizing force. (3) No one should claim that competition works perfectly even in its own proper field. It involves blunders both numerous and costly. This is to be expected. After all, economic competition is a recent device and many forces have contributed to cause it to operate under unfavorable conditions. (4) Economic competition is a term with varying content in different periods of history. It should not be regarded as a self-sufficing, self-regulating, self-operating device. It is subject to social control. We may have either *laissez faire* competition or regulated competition. As in the case of private property, competition, while far from perfect as an organizing device, measures up to the needs it serves fairly well; and, as in the case of private property, society can if it but chooses make it measure up much better.

The selections on competition have been chosen with these issues[28a] in mind:

1. What conceptions of freedom lie behind the use of competition as an organizing device?
2. What outstanding services are rendered by competition in our economic order?
3. Is competition some unchanging thing or are its forms and its utilization subject to control and alteration by society?
4. If we speak of our society as a "competitive order," in what sense is the statement correct?

1. SOME DEFINITIONS AND CHARACTERIZATIONS

"Competition is not law, but lawlessness. Carried to its logical outcome it is anarchy or the absence of law Man is a moral, spiritual, and social being, not dominated by animal law. There can be no such thing as a harmonized society with any competitive elements in it, and Christianity is impossible. Every man owes the world his life, and must live to have a life to give. In competitive conditions, not character, but cunning, survives. The gospel of success is the great insanity of modern materialism, absorbing the best brain, thought, and life of the race; we have been feeding our children to this great Moloch of success, but as a result we have been warping the intellect and making moral idiots."[29]

"Sweet competition! Heavenly maid! . . . . Nowadays hymned alike by penny-a-liners and philosophers as the ground of all society . . . . the only real preserver of the earth! Why not of Heaven, too? Perhaps there is competition among the angels, and Gabriel and Raphael have won their rank by doing the maximum of worship on the minimum of grace. We shall know some day. In the meanwhile 'these are thy works, thou parent of all good!' Man eating man, man eaten by man, in every variety of degree and method! Why does not some enthusiastic political economist write an epic on 'The Consecration of Cannibalism'?"[30]

[28a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 75–79. (University of Chicago Press.)

[29] Cleveland *Citizen*, March 14, 1896. Attributed to George D. Herron.

[30] Taken by permission from Charles Kingsley, "Cheap Clothes and Nasty," Preface to *Alton Locke*, pp. lxviii–ix. (The Macmillan Co., 1889.)

"Competition was the gigantic motor that caused nearly everybody during the first nineteen centuries of Christian civilization to use all his mental and physical powers to get ahead. The best efforts of humanity, stimulated by competition . . . . have lifted our race to a standard where the mode of living of common laborers is more comfortable and desirable than the everyday existence of the kings of whom Homer sings."[31]

Competition signifies the operation of individual self-interest, among the buyers and the sellers of any article in any market. It implies that each man is acting for himself solely, by himself solely, in exchange, to get the most he can from others, and to give the least he must himself.

1. The idea of competition is opposed to combination. Wherever, and in whatever degree, buyers or sellers act in concert, whether by insisting upon a certain price, or by regulating the amount to be bought or sold, there competition is, in so far, defeated. In competition every man is supposed to be active and alert to slip in ahead of every other man and sell his own product first, and sell it at a higher price if possible. Men in this state act as freely and as independently as the minute particles of some fine dry powder absolutely destitute of cohesion. If any two particles in the economic mass stick together, so that one must move when, and as, and because the other does, competition is in so far defeated.

2. Competition is also opposed to custom. If in any degree one buys or sells at a certain price, if he buys or sells in a certain place, if he buys or sells of or to a certain person, because he has done so in the past, he obeys the rule of custom. In competition men are assumed in every transaction to seek and find their best market, that is, the place to buy or to sell, in which, at the time, and under the circumstances existing, they can get most for what they have to sell and will give least for what they wish to buy.

3. Competition is opposed to sentiment. Whenever any economic agent does or forbears anything under the influence of any sentiment other than the desire of giving the least and gaining the most he can in exchange, be that sentiment patriotism, or gratitude, or charity, or

[31] Richard Michaelis, *Looking Further Forward*, 1890.

vanity, leading him to do any otherwise than as self-interest would prompt, in that case, also, the rule of competition is departed from.

To take one example, note what is implied in the assumption of free competition with respect to the rent of land.

On the landlord's part that (1) he would as soon take a new tenant as retain one whose family had been on the soil for centuries; that (2) he will entertain no other consideration than the realization of the largest possible rent; that (3) he knows all the facts which in any way bear upon the highest rate that could be charged for the use of the land without driving away all would-be tenants.

On the tenant's part, that (1) he has the means to place himself elsewhere; that (2) he could carry with him the value of his stock and fixtures, and of any improvements made during his tenancy; that (3) he knows and can intelligently canvass the varying advantages of a sufficient number of localities to make his choice practically indefinite; and that (4) neither indolence, nor inertia, will intervene to keep him from his best market; that is, where he can rent land, of a given degree of productiveness, at the lowest annual rate.[32]

"The strict meaning of competition seems to be the racing of one person against another, with special reference to bidding for the sale or purchase of anything. This kind of racing is no doubt both more intense and more widely extended than it used to be: but it is only a secondary, and one might say an accidental, consequence from the fundamental characteristics of modern industrial life. . . . . These characteristics are a certain independence and habit of choosing one's own course for oneself, a self-reliance; a deliberation and yet a promptness of choice and judgment, and a habit of forecasting the future and of shaping one's course with reference to distant aims. They may and often do cause people to compete with one another; but, on the other hand, they may tend, and just now indeed they are tending, in the direction of co-operation and combination of all kinds, good and evil.

"The term 'competition' has gathered about it evil savour, and has come to imply a certain selfishness and indifference to the well-being of others. Now it is true that there is less deliberate selfishness in

[32] Adapted from F. A. Walker, *Political Economy,* pp. 91–92 and p. 204. (New York: Henry Holt & Co., 1888.)

early than in modern forms of industry; but there is also less deliberate unselfishness. It is deliberateness and not selfishness that is the characteristic of the modern age."[33]

"Its opponents have rarely done it full justice. They have been so impressed by certain incidental evils connected with the system—smaller capitalists pushed to the wall by larger capitalists; intelligent workmen thrown out of employment by the process of industrial readjustment to make room for those cheaper and less skilled—that they have shut their eyes to its essential excellences. They have said that competition was nothing but a new name for the Darwinian struggle for existence as applied in modern business; that it was a glorification of the principle of survival of the strongest. This is a very imperfect view of the case. Competition is something essentially different in character from the struggle for existence among the lower animals. It is a struggle so ordered that outside parties reap a benefit instead of suffering an injury. This is its conspicuous and distinctive feature. If cats are struggling to get the same bird, and bosses are struggling to get the same workmen, the relation of the cats to one another bears some analogy to the relation of the bosses to one another. But there is this radical difference in the whole transaction: that the more cats there are, the worse for the bird; while the more bosses there are, the better for the workmen. Competition is what its name implies—a concurrent *petition;* an effort on the part of different people to do the best they can for somebody else, in order to induce him to enter into dealings with them.

"Unfortunately, it is not only the opponents of competition who fail to recognize this as its essential feature. The advocates of the system are prone to make a somewhat similar mistake. They go so far as to assume that any adjustment which is the result of free play among a mixture of conflicting social elements, strong and weak, is presumably right, and should be interfered with only when the resulting evils are so clear as to furnish the most obvious grounds for state action."[34]

[33] Adapted by permission from Alfred Marshall, *Principles of Economics,* pp. 5–6. (Macmillan and Co., Ltd., 1912.)

[34] Adapted by permission from A. T. Hadley, *Freedom and Responsibility,* pp. 121–23. (Charles Scribner's Sons, 1903. Author's copyright.)

2. THE FORMS OF ECONOMIC COMPETITION[35]

The chief forms of competition are five in number—commodity competition, individual competition, market competition, class competition, and race competition.

1. By *commodity competition* is meant the competition due to the existence of social choices. Every individual is continually debating with himself whether to purchase one commodity in preference to another. Where he is on the margin of doubt or of indifference the slightest alteration in the price will cause him to substitute something else. The principle involved is hence called the principle of substitution. The vendor must constantly be on the watch lest any increase of price cause the disappearance of his sales. We substitute, however, not only one thing for another, but also one agency of production for another: in the crucible of economic wants everything is finally tested by its capacity to afford the greatest satisfaction. Not only will the consumer choose now this and now that commodity, but the employer will increase now his labor force, now his stock of machinery, so as to secure the best results. The least change in the rate of wages or of interest may lead him to substitute the one for the other. Every economic factor, like every economic good, may be in either actual or potential competition with another. The existence of competition, however, implies the mobility or free interchange of the factors of production from enterprise to enterprise and from commodity to commodity. When the fluidity of capital and the transferability of labor are complete, the competition is absolutely free. When there are hindrances to this mobility, we speak of economic friction. The substitution of one commodity for another may be hindered by legal, social, or economic causes. Under normal conditions, however, the competition is real and effective.

2. The *competition of individuals* with each other denotes a rivalry, not between the producers of different commodities or between the different factors of production, but between the producers of the same commodity or the same factors of production. Under normal conditions competition here puts everyone on his mettle, and success is a measure of the contribution to the social fund. The more a laborer

[35] Adapted by permission from E. R. A. Seligman, *Principles of Economics*, pp. 141–45. (Longmans, Green & Co., 1905.)

produces, the higher his wages will be; the larger the output of a particular cotton mill and the lower the cost at which it can market its goods, the greater will be the benefit to the consumer as well as the advantage to the particular producer. Competition between individuals is in its results a struggle to enhance efficiency, to increase faculty, to multiply productive power, to augment ingenuity, in short, to develop economic personality. The more potent the personality, the greater will be the command over powers of nature, the more rapid will be the development of the wealth which, although owned by individuals, yet inevitably ministers to the welfare of society.

3. By *market competition* we mean, not the competition of individuals in the market, but the competition of markets with each other. Market competition includes, indeed, both commodity competition and individual competition in the sense that in every market individuals as well as commodities compete with each other; but it is something over and above these. Every great city is continually striving to develop as a centre of distribution and exchange in the well-founded hope that the wealth thus amassed will lead to productive efficiency in other lines. Here again market competition leads to reduced cost, and the struggle for market supremacy can be fought to a successful issue only through more effective service.

4. *Class competition* is the result of the differentiation of modern society into groups of producers. We have, not only the great division into laborers and capitalists, but the further separation of the latter into the owners of agricultural, commercial, and industrial capital—that is, landowners, merchants, and factory owners—and the still further subdivision of each class into minor groups. Class competition, while as inevitable as the other forms of competition, is within proper bounds just as beneficial. Whether the moneyed interest or the landed interest is more prosperous depends at bottom upon their success in making converts among the consumers, and the extent of conversion depends on what they can offer in the way of lower prices or better products. The laborers and the capitalists again represent competing interests, but the share of each in wages and profits depends ultimately on their relative contribution to the common product.

5. *Race or national competition* in its economic aspects is the final form of the modern struggle. The most marked characteristic of re-

cent progress is the gradual substitution of peaceful rivalry of commerce for the sanguinary clash of arms. The modern weapon is not the javelin or the rifle but the enterprise of the domestic producer aided by the exporter. Every nation that has reached commercial or industrial maturity endeavors to seek in the foreign market a profitable outlet for its own surplus production. This attempt to secure a market is indeed responsible for an occasional war. In the main, however, the struggle today is one for cheapness, and in the end it is not the large army or navy but the most efficient producer that permanently retains the neutral market. It is not to be denied that both a large army and a large navy may be needed to protect the commercial or other national interests; but the foundation of military greatness in modern times is primarily economic, and when economic efficiency has disappeared, military strength must also disintegrate. Here, again, national competition is salutary. The fundamental error of the old mercantilistic doctrine was the belief that what one nation gains in trade, the other necessarily loses. The modern doctrine is that every nation is helped by the prosperity of its neighbor, on the principle that the more wealthy the customer, the greater will be his purchases. Both nations may gain, although one may gain more than the other.

3. COMPETITION AND ECONOMIC FREEDOM[36]

1. The first and most obvious form of freedom is that of *marriage and divorce*. Marriage indeed is far more than an economic contrivance, even though the historical forms of marriage have been influenced by economic forces to a greater extent than is commonly recognized. Freedom of marriage especially is a product of the modern economic life. Freedom of divorce, on the other hand, existed in early society, but was at first based on inequality. After the patriarchal and modern family had been constituted, the husband could divorce the wife, but not vice versa. The newer right of divorce which rests on equality is in large measure the result of the economic emancipation of woman. Into the wider ethical and religious aspects of this great problem the present is not the place to enter.

2. Next we have *freedom of movement*. In the Middle Ages the

[36] Adapted by permission from E. R. A. Seligman, *Principles of Economics*, pp. 165–70. (Longmans, Green & Co., 1905.)

right of internal migration was often restricted. Under the settlement laws in England, for instance, it was virtually impossible for a workman to leave his native parish. In modern times the growth of freedom has brought the right, not only of internal, but of international migration. On the other hand, the prohibition of immigration which is sometimes found in modern countries must be judged in the light of liberty in the positive sense. Chinese immigration into the United States, for instance, is forbidden. Freedom of immigration, which in this case means prosperity for the employer and comparative comfort for the immigrant, implies permanent degeneration for the American workman and thus ultimate economic decay. It is a specious liberty, because based on inequality.

3. We come next to the *freedom* of occupation. The right of choosing one's profession was in former times hedged in by all manner of barriers. At its worst the system of caste and custom prevented progress because it put men into vocations for which they were not fitted. Freedom of occupation insures as far as possible the right man for the right place, and this leads to enhanced production and better distribution. The only restriction which modern society permits is the evidence of fitness, in those occupations where incompetence would imply irresponsibility and involve injury to others as well as to oneself. The certificates required from doctors, dentists, engineers, plumbers, pilots, and the like are not a hindrance, but an aid, to true liberty. The apprenticeship regulations of the trade unions, however, are sometimes good, sometimes bad. Where they are designed to insure good work, or even to prevent degradation of wages and the workman's standard of life through the irruption of large numbers of underpaid apprentices, there is much to be said for the practice. But when the object is simply to keep out competent workmen and to erect a monopolistic closed corporation, as in the late stage of the guild system, the limitation is clearly indefensible.

4. Another kind of freedom is the *freedom of association.* The chief forms of association for economic purposes are combinations of labor and combinations of capital. In classic Rome, where both political and economic aims were sought, we find a stern repression of labor associations. Even after the right of political and religious association had been won, however, combinations of labor were prohib-

ited. Under the modern factory system, such combinations have assumed the form of trade unions. It was not until 1824 in England and considerably later in America and Continental Europe that the prohibition was removed. The legitimacy of union, as such, is now accepted because it is recognized that it tends to secure the real freedom of the laborer. The individual workman in a large factory is at a clear disadvantage in dealing with the employer; the union restores the equality by securing the right of collective bargaining. In the same way the right of free association of capital in the form of corporations and other combinations has been acquired chiefly in the past half-century. Here again, however, when the nominal liberty of association results in a "restraint of trade" or virtual monopoly inimical to the general interests, the community is justified in curbing its excesses whenever the contest involves a crass inequality or is conducted without any sense of social responsibility.

5. The fifth category, *freedom of consumption,* needs only a word in this place. The sumptuary laws of old which prescribed in detail what should be eaten or worn were sometimes well-intentioned, but always mistaken. By restricting the expansion of wants, they really checked economic progress. Modern society has abandoned such a system completely, and where it becomes desirable in the interests of the public health or safety to prohibit the use of certain commodities, like over-ripe fruit, or infected meat, or opium, the end is attained far better by a prohibition of sale, under the police power of the state, than by a restriction of consumption.

6. We come, sixthly, to *freedom of production,* including freedom of contract and enterprise. Here, again, the emphasis has been shifted in modern times. The world has outgrown the time-worn conception of the citizens as the children of an all-wise and benevolent paternal government. It has been realized that governments are not always benevolent and never all-wise, and that with the growth of capital and competition better results can be secured by the repeal of the complicated and often contradictory provisions which throttle production and check individual initiative. It was this that the French manufacturers meant when they told Colbert *laissez nous faire* and thus introduced a celebrated phrase. That was indeed the necessary destructive process of pulling down the barriers which impeded progress because they

checked equal opportunity. It has been found requisite, however, in recent times to modify both the theory and the practice of *laissez-faire* in order to safeguard the interests of various classes of society. The complex requirements of modern life have necessitated a governmental regulation of many business enterprises in behalf of producers, of consumers, of investors, or of the general public. The difference between mediaeval and modern interference is to be found chiefly in the fact that the one sought to prevent competition while the other endeavors to enlarge its domain and to raise its level.

7. Finally, we have *freedom of trade*. This is virtually included under the last head, since trade is a species of production. It forms, however, so important a part of the subject that it has generally been treated separately. The modern age has seen the emancipation of internal commerce from mediaeval restrictions of all kinds. The great controversy today centres about international trade. Here, again, the general hypothesis must be in favor of freedom. Free trade, however, is not necessarily and always beneficent.

4. SOME INTERPRETATIONS OF THE CONTENT OF FREEDOM

A. FORMAL VERSUS EFFECTIVE FREEDOM[37]

In its external aspect, freedom is negative and *formal*. It signifies *freedom from subjection* to the will and control of others; exemption from bondage; release from servitude; capacity to act without being exposed to direct obstructions or interferences from others. It means a clear road, cleared of impediments, for action. It contrasts with the limitations of prisoner, slave, and serf who have to carry out the will of others.

Exemption from restraint and from interference with overt action is only a condition, though an absolutely indispensable one, of *effective freedom*. The latter requires (1) positive control of the resources necessary to carry purposes into effect, possession of the means to satisfy desires; and (2) mental equipment with the trained powers of initiative and reflection requisite for free preference and for circumspect and far-seeing desires. The freedom of an agent who is merely released from direct external obstructions is formal and empty. If he

[37] Taken by permission from John Dewey and J. H. Tufts, *Ethics*, pp. 437–38. (Henry Holt & Co., 1910.)

is without resources of personal skill, without control of tools of achievement, he must inevitably lend himself to carrying out the directions and ideas of others. If he has not powers of deliberation and invention, he must pick up his ideas casually and superficially from the suggestions of his environment and appropriate the notions which the interests of some class insinuate into his mind. If he have not powers of intelligent self-control, he will be in bondage to appetite, enslaved to routine—imprisoned within the monotonous round of an imagery flowing from illiberal interests, broken only by wild forays into the illicit.

B. NEW TYPES OF FREEDOM[38]

Seen from this angle, "liberty" takes on a new and greater meaning. In order to contrast the older, more formal ideal with this new substantial liberty, let us place the two side by side in parallel columns.

The Older Constitutional Rights	New Economic and Social Rights
1. Right to the equal protection of the laws.	1. Equal opportunities for all in the open market. a) The equal use of public facilities such as railways, canals, terminals, warehouses, wharves, etc. b) Freedom from unfair and corrupt methods of business competition, fraud, misrepresentation, combinations to destroy a competitor, exclusive contracts to stifle competition, etc.
2. Right of persons accused of crime to be safeguarded in criminal procedure.	2. Right to real protection against criminals. Cheaper and quicker justice. a) A simplified, less technical procedure in both civil and criminal suits. b) A more complete, efficient and thorough police system in both city and country districts. c) A more careful sifting of the chance offender from the habitual criminal.

[38] Taken by permission from J. T. Young, *The New American Government and Its Work*, pp. 497–98. (The Macmillan Co., 1915.)

The Older Constitutional Rights	New Economic and Social Rights
3. Freedom of speech, press and religion.	3. The freedom of the consumer from extortionate and oppressive charges in all articles of common use, meats, foods, drugs, beverages, shoes, clothing, coal, tobacco, sugar, oil, express and transportation charges.
4. No person shall be deprived of life without due process of law.	4. No person shall be deprived of the opportunities of improvement, education, and recreation, even with due process of law.
5. Freedom from compulsory quartering of soldiers in time of peace; freedom from searches and seizures in homes and dwellings.	5. Freedom from overcrowded unsanitary houses, factories, and stores; right to tenement and factory inspection and regulation.
6. No person shall be deprived of liberty or property without due process of law.	6. Right to full participation in economic progress and a salary or wage payment that will support a reasonable standard of living.
7. Right to bear arms.	7. Right to aesthetic and other higher enjoyments of civilization.

We must see clearly that the old legal freedom was a means to an end. When men were fighting a tyrant king or a selfish mother country they wanted "liberty" to pursue "happiness" or "freedom of speech," both of which were denied them. When their business is assailed by a combination, or their own and their children's chances of advancement are blocked by one or another cause, they demand greater "freedom of business opportunity." The obstacles to progress are different, the meaning of "liberty" changes.

5. THE SERVICES OF COMPETITION

A. GENERAL STATEMENT[89]

What services are they which we look to competition to perform? The first of them is the determination of prices. By this determination of prices it regulates, in the second place, the amount of production.

[89] Adapted by permission from John Bascom, *Social Theory: A Grouping of Social Facts and Principles*, pp. 148–51. (Thomas Y. Crowell & Co., 1895.)

In the third place, by the same means, it adapts production to the wants of men, and, in the fourth place, improves it in quality.

Competition determines prices.—We wish the most skilful production, we wish the low prices incident to it, and these we secure by the sifting processes of an active market. Yet this regulation is not perfect. There are most undesirable and extreme fluctuations in prices, and adventitious forces find their way freely into them. The work is done; not perfectly, but we do not as yet see how it can be better done.

Competition regulates the amount of production.—The rise and fall of prices determine the activity we can wisely direct to each branch of business. The automatic mechanism which apportions human effort among the innumerable forms of production is set in motion by competition. Here again we make bad mistakes, and suffer the evils of over-production; but we can conceive of no oversight which would take the place of the eager, interested, universal watchfulness called out by competition. The man who makes a mistake is immediately punished, and he who is alert and astute is as quickly rewarded.

Competition adapts production to the wants of men.—Competition is also constantly operative in adapting commodities to the wants and tastes of men. The increasing suitableness of products is one of the conspicuous gains of civilization, and is due almost wholly to that eager competition which is on the alert to discover and call out a new demand. This impulse has also its evil side. Desires are evoked in a mischievous, as well as in a desirable, form, and trade, seeking immediate profit, proceeds in oversight of greater ultimate good. Yet the more substantial gains are usually found with the more sound and comprehensive purposes.

Competition improves quality.—Akin to this improvement in kind is the improvement in the quality of goods. Great successes are often achieved in this direction. The enterprise that shows itself in superior quality of production unites at once personal and general welfare. Nor can we otherwise give equal vigor to this spirit of improvement. Yet here, as elsewhere, our gains are accompanied with corresponding losses. Competition is responsible for those imitations and imperceptible changes which cheapen products without an equivalent reduction of prices. Each advance gives occasion to a regression by which our gains are in part stolen from us.

Competition regulates the sharing of goods.—Competition, through its service in settling price, quantity, adaptation, and quality, becomes the chief instrument in distribution. While we are by no means satisfied with the way in which products are divided among producers, we are at a loss to discover any more just principle than that involved in competition, or any practical method of distribution promoting more effectively the general purpose of social discipline.

B. COMPETITION DETERMINES THE FATE OF INDUSTRIES[40]

Suppose that the market price of iron, as fixed by supply and demand, is insufficient to cover the expense of producing it. No investor seeking a business opening is likely to go into the production of iron, nor will those already engaged in the business increase their plant or even renew it when it wears out. If at the same time there is another article, for instance, copper, whose market price, as fixed by supply and demand, affords a large excess over the expense of production, new investors will seek to produce copper, while those already engaged in the business will extend their plant and keep it up to the highest standard of efficiency. We shall see a diminution of the output of iron and an increase of the output of copper, by a process which, though not generally involving actual transfer of capital from one industry to another, amounts to the same thing in its effect on the community. The permanent supply of iron being diminished, while the conditions of demand remain the same, the producers will be able to charge a higher price and yet dispose of the total product; while, conversely, the permanent supply of copper being increased, the producers will be forced to charge a lower price in order to call forth a corresponding demand. This process will go on until the profit in the production of copper is no greater than that in the production of iron.

This adjustment actually takes place among the industries of the country as a whole.

C. COMPETITION DETERMINES SURVIVAL OF INDUSTRIAL METHODS[41]

When the handicraftsman begins to find his product undersold by the machine-made article, his first instinct is to engage in a desperate

[40] Adapted by permission from A. T. Hadley, *Economics*, pp. 86–87. (G. P. Putnam's Sons, 1899.)

[41] Taken by permission from Sidney and Beatrice Webb, *Industrial Democracy*, pp. 414–16. (Longmans, Green & Co., 1902.)

competition with the new process, lowering his rate for hand labor to keep pace with the diminished cost of the machine product. This is obviously the "line of least resistance." He confidently pits his skill against the first clumsy attempts of the undeveloped machine, and finds that a slight reduction in the Standard Rate for hand labor is all that seems required to leave his handicraft in full command of the market. His well-intentioned friends, the clergyman and the district visitor, the newspaper economist and the benevolent employer, combine to assure him that this—the Policy of Lowering the Dyke—is what he ought to adopt.

But, unfortunately, this is to enter on a downward course to which there is no end. The machine product steadily improves in quality and falls in price, as the new operatives become more skilled, and as the speed of working is increased. Every step in this evolution means a further reduction of rates to the struggling handworker, who can only make up his former earnings by hurrying his work and lengthening his hours. Inevitably this hurry and overwork deteriorate the old quality and character of his product. The attempt to maintain his family in its old position compels him to sacrifice everything to the utmost possible rapidity of execution. His wife and children are pressed into his service, and a rough and ready division of labor serves to economize the use of the old thought and skill. The work insidiously drops its artistic quality and individual character. In the losing race with the steam engine, the handwork becomes itself mechanical, without acquiring either that uniform excellence or accurate finish which is the outcome of the perfected machine. Presently, the degraded hand product will sell only at a lower price than the machine-made article. The worse the work becomes the more irregular grows the demand. Those select customers who have remained faithful to the hand product find, by degrees, that its former qualities have departed, and they one by one accept the modern substitute.

There is now no question of his taking to the new process, which has risen quite beyond his capacity. He passes through the long-drawn-out agony of a dying trade.

a state of peace, generating hostile passions instead of sympathy and love. The bloody conflicts of our brute ancestors have been replaced by something less obvious and open but—so we are told—equally bitter and destructive, morally speaking the same thing.

Yet there is no inevitable association between competition and hostility. In great measure the selective process operates without generating personal feeling. A young man, for example, starts out in life with the purpose of following a certain profession—let us say the law. The experience of two or three years convinces him and others that he cannot succeed in this, and he makes his way into something else. About half the graduates of our law schools are eliminated in this way, and the same sort of thing takes place in other trades and professions. But the process is gradual and the eliminating forces, as a whole, impersonal; that is to say, they are too many, too intangible, to make an impression of wilful personal opposition. Disappointment may ensue, but not hatred; except in the case of weak and abnormally sensitive minds whose uncontrolled emotions lead them to ascribe every painful experience to the malignant purpose of others. So with commercial competition; a man's trade gradually increases or declines; but there is seldom any one person who can be fixed upon as the cause. In fact, while admitting the existence of a great deal of competitive bitterness, I believe that most men look upon the social conditions under which they work very much as the farmer looks upon the weather and other natural agents. They may make or mar him, and he thrives or suffers accordingly, but there is no single person to hold responsible.

It may be maintained that competition, when not unjust or destructive, promotes a broader social feeling. The free and open play of energy and purpose is calculated to arouse precisely that knowledge of others, and of the limitations which their life imposes upon ours, out of which a wholesome sympathy and a sense of justice must spring. Competition involves contact and usually necessitates some degree of mutual comprehension. To succeed one must understand opposing forces, and understanding is the beginning of sympathy.

E. COMPETITION DECIDES THE RIVALRY OF CITIES AND MARKETS[43]

The history of the distribution of the surplus grain from the interior markets at which it has been accumulated to the centers of consumption eastward and southward is summed up in one word—competition. During the past century the main lines of distribution have shifted several times: first, the grain went south by way of the Ohio and the Mississippi rivers, from Cincinnati and St. Louis to New Orleans, thence to the east by coastwise ships; secondly, the opening of the Erie Canal (1825) turned the cereal movement eastward to New York; thirdly, the railroads and the lakes competed for the grain traffic (1860–70); fourthly, the railroads and the Erie Canal kept up a competitive struggle for ten years, and, fifthly, the rise of the southern movement of grain traffic by rail to the Gulf became a permanent factor again.

Besides the competition of railroads with waterways in the distribution of grain and the competition of railroads with one another, a third factor of equal importance enters into this movement—that is, the competition of the seaboard cities for the control of the cereal movement.

On the Atlantic seaboard there are five ports connected by railway lines with the primary grain markets of the interior, either by rail or by water and rail routes. The shortest rail line had formerly been regarded as in the best position to get this traffic from the eastern lake ports to the seaports. This favored carrier was the New York Central; and New York City, by virtue of the Erie Canal, was regarded as naturally entitled to the lion's share of the grain traffic in the East and for export. While this position was conceded by other carriers, it was not accepted as the end of the matter. Other roads, naturally less favored, found in reckless competition a means of wresting concessions from the Central in the form of a differential. This differential was an attempt to equalize the opportunities for getting eastward traffic among the trunk lines, by maintaining lower rates for less favored roads in proportion to the disadvantage of extra rail distance above that of the Central. The differentials granted at first to Boston, Philadelphia, and Baltimore covered disadvantages in exportation also from these ports. Later, this differential was extended to Newport News, as

[43] Adapted from the *Report of the Industrial Commission*, 1900, VI, 111–14, 124.

a means of setting limits to the competitive struggle for a division of traffic among the trunk lines concerned. This arrangement, as a working basis among competing grain lines, began in 1876, and has not since been successfully attacked in principle, though there have been reductions in the amount of the differential. Such seems to be the state of the question as far as it concerns the grain movement to the seaboard cities of the United States.

From the standpoint of the interior cities, competition is quite as keen as it is among the seaboard cities in the distribution of grain.

It seems clear, then, that the existing system of distribution of the visible supply of grain involves three main commercial interests: first, that of the grain-carrying transportation lines; secondly, that of the competitive interior markets at which the movement begins; and, thirdly, that of the seaboard cities at which internal distribution ends. All of these interests act and react one upon another, and the existing system has been wrought out under the impact of their powerful influences.

F. COMPETITION AND FAIR PRICE[44]

The old theory of value was that every article had a just price; that the buyer would naturally try to pay less than that price, the seller to exact more; that whichever man succeeded gained a slight earthly advantage at corresponding peril to his soul—this peril being especially great in the case of the seller, because he was usually more skilful than the buyer and was likely to make this unfair gain a means of livelihood. For the double purpose of protecting the buyer against dangers in this life and the seller against dangers in the life to come, it was habitual for the authorities to fix prices on many of the articles of common use, and to exact severe penalties for any variation from these prices. If the authorities thought that a loaf of bread ought to cost two pence, they set the price accordingly and cut off the ears of the offending baker who should undertake to charge more. Of course the result of this was to fix the price at two pence. No baker was going to jeopardize his soul's salvation and his ears at the same time. The effect of this low price was that the consumers used bread as freely as before, instead of economizing it; and, after a few weeks, in place of

[44] Adapted by permission from A. T. Hadley, *Freedom and Responsibility*, pp. 117–21. (Charles Scribner's Sons, 1903. Author's copyright.)

the slight deficiency of supply which was tending to cause the increase in price, the community found itself face to face with an actual scarcity of the necessaries of life. The artificial system of price regulation had intensified the very evil that it was intended to prevent.

This experience with sales and prices was the basis of the principle of competition, which has taken such a hold on modern industrial life. If the goods are scarce, we let the buyers bid against one another; holding that by this process of selection we shall put such supplies as we have in the place where they are most urgently needed, and shall stimulate real economy in the use of the article by the temporary increase in its price. If the seller thus obtains a considerable gain, we regard this gain as fairly due to his forethought in providing the market with a supply of goods which would otherwise have been absent; and we interfere only when, by some combination or monopoly, he has produced an artificial scarcity instead of helping to meet one which already existed from natural causes. We believe also that the best remedy for a scarcity is to stimulate competition on the part of other producers who will devote their energies toward bringing new supplies to market; and who, if the scarcity is widespread or long continued, will invest new capital in the production of the goods thus urgently needed. We believe that the exceptional profit which these producers obtain until the deficiency of supply has been made good is but a natural and normal means of stimulating them to the utmost exertions in making good the deficiency and of rewarding them for their foresight in doing it rightly.

There can, I think, be no reasonable doubt that the world is far better served under this competitive system than under any other system of industrial regulation which has hitherto been tried. The effect has been so marked that modern law—the English first and the continental afterward—has gradually adjusted itself to the conception that prices should be let alone wherever competition can regulate them; that a price obtained in open market, without fraud or artificial monopoly, is *ipso facto* a fair price; and that a man does no wrong to those with whom he deals if he buys as cheaply as he can and sells as dearly as he can. These legal principles have been reflected in our ethical conceptions. We assume that a competitive price is a morally just price; that what a man can obtain for an article in open market

at the moment represents its present value; and that the average price which he can obtain in the long run represents its true or permanent value.

See also:
"The Church and Its Teachings," page 217.
"Fair Dealing and Fair Price," page 228.

6. THE BRIEF, INCOMPLETE REIGN OF COMPETITION[45]

It would be a great misconception of the actual course of human affairs, to suppose that competition exercises in fact unlimited sway. I am not speaking of monopolies, either natural or artificial, or of any interferences of authority with the liberty of production or exchange. I speak of cases in which there is nothing to restrain competition; no hindrances to it either in the nature of the case or in artificial obstacles; yet in which the result is not determined by competition, but by custom or usage; competition either not taking place at all, or producing its effect in quite a different manner from that which is ordinarily assumed to be natural to it.

Competition, in fact, has only become in any considerable degree the governing principle of contracts at a comparatively modern period. The farther we look back into history, the more we see all transactions and engagements under the influence of fixed customs. The reason is evident. Custom is the most powerful protector of the weak against the strong; their sole protector where there are no laws or government adequate to the purpose. Custom is a barrier which, even in the most oppressed condition of mankind, tyranny is forced in some degree to respect. To the industrious population, in a turbulent military community, freedom of competition is a vain phrase; they are never in a condition to make terms for themselves by it; there is always a master who throws his sword into the scale, and the terms are such as he imposes. But though the law of the strongest decides, it is not the interest nor in general the practice of the strongest to strain that law to the utmost, and every relaxation of it has a tendency to become a custom, and every custom to become a right. Rights thus

[45] Adapted by permission from J. S. Mill, *Principles of Political Economy,* Vol. I, Book II, chap. iv. (D. Appleton & Co., 1893.)

originating, and not competition in any shape, determine, in a rude state of society, the share of the produce enjoyed by those who produce it.

Prices, whenever there was no monopoly, came earlier under the influence of competition, and are much more universally subject to it, than rents: but that influence is by no means, even in the present activity of mercantile competition, so absolute as is sometimes assumed.

The wholesale trade, in the great articles of commerce, is really under the dominion of competition. There, the buyers as well as sellers are traders and manufacturers, and their purchases are not influenced by indolence or vulgar finery, but are business transactions. In the wholesale markets, therefore, it is true as a general proposition that there are not two prices at one time for the same thing: there is at each time and place a market price, which can be quoted in a price-current. But retail price, the price paid by the actual consumer, seems to feel very slowly and imperfectly the effect of competition; and when competition does exist, it often, instead of lowering prices, merely divides the gains of the high price among a greater number of dealers. The influence of competition is making itself felt more and more through the principal branches of retail trade in the large towns; and the rapidity and cheapness of transport, by making consumers less dependent on the dealers in their immediate neighbourhood, are tending to assimilate more and more the whole country to a large town: but hitherto it is only in the great centres of business that retail transactions have been chiefly, or even much, determined by competition. Elsewhere it rather acts, when it acts at all, as an occasional disturbing influence; the habitual regulator is custom, modified from time to time by notions existing in the minds of purchasers and sellers, of some kind of equity or justice.

In many trades the terms on which business is done are a matter of positive arrangement among the trade, who use the means they always possess of making the situation of any member of the body who departs from its fixed customs, inconvenient or disagreeable. All professional remuneration is regulated by custom. The fees of physicians, surgeons, and barristers, the charges of attorneys, are nearly invariable. Not certainly for want of abundant competition in those

professions, but because the competition operates by diminishing each competitor's chance of fees, not by lowering the fees themselves.

Since custom stands its ground against competition to so considerable an extent, even where, from the multitude of competitors and the general energy in the pursuit of gain, the spirit of competition is strongest, we may be sure that this is much more the case where people are content with smaller gains, and estimate their pecuniary interest at a lower rate when balanced against their ease or their pleasure. I believe it will often be found, in Continental Europe, that prices and charges, of some or of all sorts, are much higher in some places than in others not far distant, without its being possible to assign any other cause than that it has always been so: the customers are used to it, and acquiesce in it. An enterprising competitor, with sufficient capital, might force down the charges, and make his fortune during the process; but there are no enterprising competitors; those who have capital prefer to leave it where it is, or to make less profit by it in a more quiet way.

A further discussion of competition may be found in the final chapter of Part III.

F. Social Control, Especially Law and Government

Our discussion of private property, contract, individual initiative, and pecuniary competition showed that these are neither unchanging nor are they separate and distinct from the rest of that body of thought-patterns and guides to action which surround the individual in our society. These, with other institutions, direct and restrain the individual and are used by him. Like other controls, they are what the group permits them to be. Themselves instruments of control, they are none the less subject to control as the attitudes of the group change from time to time.

There are many ways by which the attitudes and usages of the group become effective. Some of these ways are informal; some are formal; and some lie between the two extremes. At one extreme are such ways as customs, tradition, morals, and religion. These, although their rules and principles are not usually set forth in any formal way, shape our thinking and acting although we are not conscious of it, so unobtrusively have they fastened their grip upon us during our early

plastic years. Such forms of social control are accordingly often called "informal" or "unconscious" social controls. Their influence is felt throughout our producing activities. To cite examples of harmful influences, stupid customary business procedures continue to be followed; inconvenient measuring devices like the yard or the ounce are retained. On the other hand, some economy of effort results from following established practices unthinkingly.

At the other extreme are such formal and conscious, or at least semiconscious, ways of control as law and government, which also powerfully affect our organization for production. Law and government forbid certain activities, give aid to others, command still others, and, in the case of government, actually engage in the production of economic goods and services. Law and government (as well as our informal controls) regulate or establish procedures by authority of the group, and they thus aid (as do also informal controls) in the establishment of that certainty of human relationships which is essential to a régime of individual initiative.

In addition to the before-mentioned controls there are many other ways by which group attitudes are made effective.

Each of these ways, formal and informal, progressive and conservative, conscious and unconscious, legal, customary, religious, and traditional, plays an important part in providing the social setting which to such a significant degree conditions our producing activities.

The following selections should be read with these issues[45a] in mind:

1. We speak of our economic order as being one of individual initiative, but can the individual really exercise initiative; can he shake off the thralls of the group?
2. How large does the rational element—the element of scientific thought—seem to be in our social control?
3. Does our industry operate within a fairly rigid framework of social institutions and social control?
4. In particular, does our industry operate within an intricate legal and governmental framework?
5. Have we any "standards" with respect to the "proper sphere" of government; and if we have, whence came they?

[45a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 80–83. (University of Chicago Press.)

1. CONSCIOUS AND UNCONSCIOUS SOCIAL CONTROL[46]

The first task of life is to live. Men begin with acts, not with thoughts. Every moment brings necessities which must be satisfied at once. Need was the first experience, and it was followed at once by a blundering effort to satisfy it. It is generally taken for granted that men inherited some guiding instincts from their beast ancestry, and it may be true, although it has never been proved. If there were such inheritances, they controlled and aided the first efforts to satisfy needs. Need was the impelling force. Pleasure and pain were the rude constraints which defined the line on which efforts must proceed. Thus ways of doing things were selected, which were expedient. They answered the purpose better than other ways, or with less toil and pain. Along the course on which efforts were compelled to go, habit, routine, and skill were developed. The struggle to maintain existence was carried on, not individually, but in groups. Each profited by the other's experience; hence there was concurrence toward that which proved to be most expedient. Hence the way turned into customs and became mass phenomena. Instincts were developed in connection with them. In this way *folkways arise.* The young learn them by tradition, imitation, and authority. The folkways, at a time, provide for all the needs of life then and there. They are uniform, universal in the group, imperative, and invariable. As time goes on, the folkways become more and more arbitrary, positive, and imperative.

From recurrent needs arise habits for the individual and customs for the group, but these results are consequences which were never conscious, and never foreseen or intended. They are not noticed until they have long existed, and it is still longer before they are appreciated. Another long time must pass, and a higher stage of mental development must be reached, before they can be used as a basis from which to deduce rules for meeting, in the future, problems whose pressure can be foreseen. The folkways, therefore, are not creations of human purpose and wit. They are like products of natural forces which men unconsciously set in operation, or they are like the instinctive ways of animals, which are developed out of experience, which reach a final form of maximum adaptation to an interest, which are handed

[46] Adapted by permission from W. G. Sumner, *Folkways*, pp. 2–6, 28–46, 53–60. (Ginn & Co., 1913.)

down by tradition and admit of no exception or variation, yet change to meet new conditions, still within the same limited methods, and without rational reflection or purpose. *From this it results that all the life of human beings, in all ages and stages of culture, is primarily controlled by a vast mass of folkways handed down from the earliest existence of the race, having the nature of the ways of other animals, only the topmost layers of which are subject to change and control, and have been somewhat modified by human philosophy, ethics, and religion, or by other acts of intelligent reflection.*

The folkways, being ways of satisfying needs, have succeeded more or less well, and therefore have produced more or less pleasure or pain. Their quality always consisted in their adaptation to the purpose. If they were imperfectly adapted and unsuccessful, they produced pain, which drove men on to learn better The folkways are, therefore, (1) subject to a strain of improvement toward better adaptation of means to ends, as long as the adaptation is so imperfect that pain is produced. They are also (2) subject to a strain of consistency with each other, because they all answer their several purposes with less friction and antagonism when they co-operate and support each other. The form of industry, the forms of the family, the notions of property, the constructions of rights, and the types of religion show the strain of consistency with each other through the whole history of civilization. The two great cultural divisions of the human race are the oriental and the occidental. Each is consistent throughout; each has its own philosophy and spirit; they are separated from top to bottom by different mores, different standpoints, different ways, and different notions of what societal arrangements are advantageous.

The folkways are the "right" ways to satisfy all interests, because they are traditional and exist in fact. They extend over the whole of life. There is a right way to catch game, to win a wife, to make one's self appear, to cure disease, to honor ghosts, to treat comrades or strangers, to behave when a child is born, on the warpath, in council, and so on in all cases which can arise. The ways are defined on the negative side, that is, by taboos. The "right" way is the way which the ancestors used and which has been handed down. The tradition is its own warrant. It is not held subject to verification by experience. The notion of right is in the folkways. It is not outside of them, of in-

dependent origin, and brought to them to test them. In the folkways, whatever is, is right. This is because they are traditional, and therefore contain in themselves the authority of the ancestral ghosts. When we come to the folkways we are at the end of our analysis. The notion of right and ought is the same in regard to all the folkways, but the degree of it varies with the importance of the interest at stake. "Rights" are the rules of mutual give and take in the competition of life which are imposed on comrades in the in-group, in order that the peace may prevail there which is essential to the group strength. Therefore rights can never be "natural" or "God-given," or absolute in any sense. The morality of a group at a time is the sum of the taboos and prescriptions in the folkways by which right conduct is defined. Therefore morals can never be intuitive. They are historical, institutional, and empirical. World philosophy, life policy, right, rights, and morality are all products of the folkways. They are reflections on, and generalizations from, the experience of pleasure and pain which is won in efforts to carry on the struggle for existence under actual life conditions. The generalizations are very crude and vague in their germinal forms. They are all embodied in folklore, and all our philosophy and science have been developed out of them.

When the elements of truth and right are developed into doctrines of welfare, the folkways are raised to another plane. They then become capable of producing inferences, developing into new forms, and extending their constructive influence over men and society. Then we call them the mores. *The mores are the folkways, including the philosophical and ethical generalizations as to societal welfare which are suggested by them, and inherent in them, as they grow.*

It can be seen that philosophy and ethics are products of the folkways. They are taken out of the mores, but are never original and creative; they are secondary and derived.

The masses are the real bearers of the mores of the society. They carry tradition. The folkways are their ways. They accept influence or leadership, and they imitate, but they do so as they see fit, being controlled by their notions and tastes previously acquired. They may accept standards of character and action from the classes, or from foreigners, or from literature, or from a new religion, but whatever they take up they assimilate and make it a part of their own mores,

which they then transmit by tradition, defend in its integrity, and refuse to discard again. Consequently, the writings of the literary class may not represent the faiths, notions, tastes, standards, etc., of the masses at all. The literature of the first Christian centuries shows us scarcely anything of the mores of the time, as they existed in the faith and practice of the masses. Every group takes out of a new religion which is offered to it just what it can assimilate with its own traditional mores. Christianity was a very different thing amongst Jews, Egyptians, Greeks, Germans, and Slavs. It would be a great mistake to suppose that any people ever accepted and held philosophical or religious teaching as it was offered to them, and as we find it recorded in the books of the teachers. The mores of the masses admit of no such sudden and massive modification by doctrinal teaching. The process of assimilation is slow, and it is attended by modifying influences at every stage. What the classes adopt, be it good or ill, may be found pervading the mass after generations, but it will appear as a resultant of all the vicissitudes of the folkways in the interval.

Institutions and laws are produced out of mores.—An institution consists of a concept (idea, notion, doctrine, interest) and a structure. The structure is a framework, or apparatus, or perhaps only a number of functionaries set to co-operate in prescribed ways at a certain conjuncture. The structure holds the concept and furnishes instrumentalities for bringing it into the world of facts and action in a way to serve the interests of men in society.

Institutions are crescive or enacted. They are crescive when they take shape in the mores, growing by the instinctive efforts by which the mores are produced. Then the efforts, through long use, become definite and specific. Property, marriage, and religion are the most primary institutions. They began in folkways. They became customs. They developed into mores by the addition of some philosophy of welfare, however crude. Then they were made more definite and specific as regards the rules, the prescribed acts, and the apparatus to be employed. This produced a structure, and the institution was complete.

Enacted institutions are products of rational invention and intention. They belong to high civilization. Banks are institutions of credit, founded on usages which can be traced back to barbarism. There came a time when, guided by rational reflection on experience,

men systematized and regulated the usages which had become current, and thus created positive institutions of credit, defined by law and sanctioned by the force of the state. Pure enacted institutions which are strong and prosperous are hard to find. It is too difficult to invent and create an institution, for a purpose, out of nothing.

Acts of legislation come out of the mores.—In low civilization all societal regulations are customs and taboos, the origin of which is unknown. Positive laws are impossible until the stage of verification, reflection, and criticism is reached. Until that point is reached there is only customary law, or common law. The customary law may be codified and systematized with respect to some philosophical principles, and yet remain customary. The codes of Manu and Justinian are examples. Enactment is not possible until reverence for ancestors has been so much weakened that it is no longer thought wrong to interfere with traditional customs by positive enactment. Even then there is reluctance to make enactments, and there is a stage of transition during which traditional customs are extended by interpretation to cover new cases and to prevent evils. Legislation, however, has to seek standing ground on the existing mores, and it soon becomes apparent that legislation, to be strong, must be consistent with the mores. Things which have been in the mores are put under police regulation and later under positive law. It is always a question of expediency whether to leave a subject under the mores, or to make a police regulation for it, or to put it into the criminal law. Betting, horse racing, dangerous sports, electric cars, and vehicles are cases now of things which seem to be passing under positive enactment and out of the unformulated control of the mores. When an enactment is made, there is a sacrifice of the elasticity and automatic self-adaptation of custom; but an enactment is specific and is provided with sanctions. Enactments come into use when conscious purposes are formed, and it is believed that specific devices can be framed by which to realize such purposes in the society. Then also prohibitions take the place of taboos, and punishments are planned to be deterrent rather than revengeful.

When folkways have become institutions or laws they have changed their character and are to be distinguished from the mores. The element of sentiment and faith inheres in the mores. Laws and institutions have a rational and practical character, and are more me-

chanical and utilitarian. The great difference is that institutions and laws have a positive character, while mores are unformulated and undefined. There is a philosophy implicit in the folkways; when it is made explicit it becomes technical philosophy. Objectively regarded, the mores are the customs which actually conduce to welfare under existing life conditions. Acts under the laws and institutions are conscious and voluntary; under the folkways they are always unconscious and involuntary, so that they have the character of natural necessity.

We may now formulate a more complete definition of the mores. They are the ways of doing things which are current in a society to satisfy human needs and desires, together with the faiths, notions, codes, and standards of well living which inhere in those ways, having a genetic connection with them.

2. INFORMAL SOCIAL CONTROL

A. GENERAL STATEMENT[47]

Informal social control is exercised chiefly through (1) custom, (2) public opinion, (3) conscience, (4) religion. These no doubt tend to overlap and pass over into each other, but we may distinguish them broadly.

Custom stands for the conformity of the individual to the traditional and general ways of acting in some group. Its agencies are imitation and suggestion, positive drill or ritual, conscious desire to be like others of our group and not "queer" or "outlandish." It thus governs in the relatively stable external and general aspects of conduct.

Public opinion expresses the more conscious active and adjustable constraint. It acts through direct praise or blame or through the remoter rewards and penalties. It stamps some as "having gained success," others as "failures." It awards to some public office, to others business popularity, to others social distinction. It defeats the unpopular candidate, ruins financially the disliked business, ostracizes socially the man who violates the code of club or class. It is typically represented by the "honorable" and "dishonorable."

Conscience stands for a more penetrating, careful, and disinterested judgment than public opinion. It professes to be guided by

[47] Prepared by J. H. Tufts.

standards more permanent than those of shifting favor. When it pronounces conduct right or wrong it looks at motives or results more searchingly, and when it speaks of "duty" to creditors, to fellow-workmen, to employer, to employee, to family, or to the community it implies a set of personal relations in which the individual is placed, and which he may not break. Just why he ought to keep his word, to be honest, to care for his children, to stand by his union, he may not be able to state; but he feels the tug of forces binding him closely to those with whom he is in constant relation, feebly to those of a different class or race or living at a distance.

Religion embodies a conviction that the universe is not a mere machine but is on the side of right and good, and will not suffer wrong finally to triumph or evil to prevail. It embodies men's demands for a fairer tribunal, a more just order of society, a larger scope of opportunity than falls to the human lot here. It adds a higher authority to conscience. It gives a more personal symbol for the unity among men when it calls them sons of one god and therefore brothers of a spiritual kindred.

All these controls of custom, public opinion, conscience, and religion have periods of relative strength and times of relative weakness. The former are likely to coincide with simplicity of racial elements, fixity of social classes, continuity of industrial practices and economic status, persistence of political power, and an absence of any striking discoveries or inventions. Weakness comes when races mingle, bringing conflicting customs, or when old customs no longer meet new economic situations; when classes break down and new ambitions are born among those hitherto accepting their status passively or as part of a providential order; when existing governments are overthrown and new groups gain power; when new economic forces upset older ways of distribution; when new discoveries in science compel new conceptions of the universe.

B. THE NATURE AND IMPORTANCE OF HABIT[48]

When we look at living creatures from an outward point of view, one of the first things that strikes us is that they are bundles of habits. In wild animals, the usual round of daily behaviour seems a necessity

[48] Adapted with permission from William James, *Principles of Psychology,* pp. 104–21. (Henry Holt & Co., 1890.)

implanted at birth; in animals domesticated, and especially in man, it seems, to a great extent, to be the result of education. The habits to which there is an innate tendency are called instincts; some of those due to education would by most persons be called acts of reason.

We may trace some of the practical applications of the principle to human life.

The first result of it is that *habit simplifies the movements required to achieve a given result, makes them more accurate and diminishes fatigue.*

Man is born with a tendency to do more things than he has ready-made arrangements for in his nerve centres. Most of the performances of other animals are automatic. But in him the number of them is so enormous, that most of them must be the fruit of painful study. If practice did not make perfect, nor habit economize the expense of nervous and muscular energy, he would therefore be in a sorry plight.

The next result is that *habit diminishes the conscious attention with which our acts are performed.* When we are learning to walk, to ride, to swim, skate, fence, write, play, or sing, we interrupt ourselves at every step by unnecessary movements and false notes. When we are proficients, on the contrary, the results not only follow with the very minimum of muscular action requisite to bring them forth, they also follow from a single instantaneous "cue." The marksman sees the bird, and before he knows it, he has aimed and shot. A gleam in his adversary's eye, a momentary pressure from his rapier, and the fencer finds that he has instantly made the right parry and return.

Habit is thus the enormous fly-wheel of society, its most precious conservative agent. It alone is what keeps us all within the bounds of ordinance, and saves the children of fortune from the envious uprisings of the poor. It alone prevents the hardest and most repulsive walks of life from being deserted by those brought up to tread therein. It keeps the fisherman and the deck-hand at sea through the winter; it holds the miner in his darkness, and nails the countryman to his log-cabin and his lonely farm through all the months of snow; it protects us from invasion by the natives of the desert and the frozen zone. It dooms us all to fight out the battle of life upon the lines of our nurture or our early choice, and to make the best of a pursuit that disagrees, because there is no other for which we are fitted, and it is too late to

begin again. It keeps different social strata from mixing. Already at the age of twenty-five you see the professional mannerism settling down on the young commercial traveller, on the young doctor, on the young minister, on the young counsellor-at-law. You see the little lines of cleavage running through the character, the tricks of thought, the prejudices, the ways of the "shop," in a word, from which the man can by-and-by no more escape than his coat sleeve can suddenly fall into a new set of folds. On the whole, it is best he should not escape. It is well for the world that in most of us, by the age of thirty, the character has set like plaster, and will never soften again.

C. PUBLIC OPINION[49]

Genuine opinion is neither cold, logical judgment nor irrational feeling. It is scientific hypothesis, to be tested and revised as experience widens. Opinion is a view of a situation based on grounds short of proof. In a valid opinion they must be *just* short of proof. Good opinion is not spasmodic. The mind must have made a very wide sweep, made the complete circuit of the compass. It must first have hunted down the predisposing prejudice and neutralized it and then bent itself to discovering all the factors that converge upon the situation. But good opinion is not flabby or uncertain. It is not a "much to be said on both sides." It is a provisional conviction to be held as a conviction until new light alters it. It strains constantly toward truth. It invites criticism. It has the scientist's disinterestedness in its own conviction. What it wants is to understand, to get the thing it is judging rightly placed, to grasp its true meaning in the world.

Opinion, however, aims not at a mere static comprehension. It is a force, and the only force that can be relied upon in the long run to fortify the will and clear the vision. Conviction, gripped after the widest possible survey of the field, is what we must act upon if we are to effect those social changes which most of us desire. The world has generally preferred to act from logical consistency or from the high elation of feeling, rather than upon daring and clear-sighted experiment. The idea of a social and political opinion which, free from moral prejudice, strains toward scientific proof, as the hypotheses of

[49] Adapted by permission from an editorial in the *New Republic,* IV (1915), 171–72.

the physicist strain toward physical laws, is still very new, but it is already playing havoc with the old, crusted folkways.

If such opinion is to be the force of the future, there cannot be too much of its guiding thread. Yet it constantly becomes not easier but harder to form valid opinions. We are stunned by the volume of what there is to know in the human world.

D. TRADITION AND SOCIAL INHERITANCE[50]

Tradition is, in the development of society, what heredity is in the physical growth of the stock. It is the link between past and future, it is that in which the effects of the past are consolidated and on the basis of which subsequent modifications are built up. We might push the analogy a little farther, for the ideas and customs which it maintains and furnishes to each new generation as guides for their behavior in life are analogous to the determinate methods of reaction, the inherited impulses, reflexes, and instincts with which heredity furnishes the individual. The tradition of the elders is, as it were, the instinct of society. It furnishes the prescribed rule for dealing with the ordinary occasions of life which is for the most part accepted without inquiry and applied without reflection. It furnishes the appropriate institution for providing for each class of social needs, for meeting common dangers, for satisfying social wants, for regulating social relations. It constitutes, in short, the framework of society's life which to each new generation is a part of its hereditary outfit.

But of course in speaking of tradition as a kind of inheritance we conceive of it as propagated by quite other than biological methods. In a sense its propagation is psychological, it is handed on from mind to mind, and even though social institutions may in a sense be actually incorporated in material things, in buildings, in books, in coronation robes, or in flags, still it need not be said that these things are nothing but for the continuity of thought which maintains and develops their significance. Yet the forces at work in tradition are not purely psychological; at least, they are not to be understood in terms of individual psychology alone. What is handed on is not merely a set of ideas, but the whole social environment; not merely certain ways of

[50] Taken by permission from L. T. Hobhouse, *Social Evolution and Political Theory*, pp. 33–36. (Columbia University Press, 1911.)

thinking or of acting, but the conditions which prescribe to individuals the necessity for thinking or acting in certain specific ways if they are to achieve their own desires.

3. LAW IN SOCIAL CONTROL

A. THE LEGAL FRAMEWORK OF INDUSTRY[51]

Classification of legal adjustments.—Industrial laws and customs are of two general sorts according to the authority upon which they rest. They are either facts of history, like the absence of slavery or the institution of private property, or they are laws passed by some legislative body which prescribe the conditions under which men may work. The following is a classification of those laws and rules of conduct which make up the background of our industrial society.

ANALYSIS OF THE LEGAL FRAMEWORK OF INDUSTRY

- Legal framework of industry
  - I. Primary rights that rest on history
    - 1. Law of property
      - a. Property in land
      - b. Property in capital
      - c. Property in organization
      - d. Property in consumable goods
    - 2. Law of person
      - a. Individual freedom
      - b. Equality of opportunity
      - c. Number and movement
      - d. Voluntary association
  - II. Secondary rights that rest on acts of government
    - 1. Rules imposing conditions of work
      - a. Laws which prescribe conditions
      - b. Laws which provide for supervisory control
      - c. Laws which provide for administrative control
    - 2. Government as protector
      - a. Protection against aggression from without
      - b. Protection from violence within
      - c. Enforcement of legal contracts

The law of property.—The necessity of a law of property of some sort is an eternal necessity. No society, at least no industrial society that puts into practice the principle of division of labor, can exist without a law of property. The important fact about property is that it gives control over the thing owned. It gives someone the right to say where and how a thing is to be used. Under no other conditions will free men consent to work.

[51] H. C. Adams, *Description of Industry*, pp. 34–53. (Henry Holt & Co., 1918.)

According to our system of law, men may become proprietors of the instruments of production and are acknowledged owners of the products that result from the use of these instruments. They may buy and sell as they see fit those things which they own, and in every way control their use except it be that in their use they do something contrary to the interest of the public as a whole. From this it is evident that the institution of private property has given to men that liberty of action and control over work to which history gives the name of industrial freedom. The present law recognizes property in land, property in capital, property in organization, and property in consumable goods.

The law of personal liberty.—The social aim of the English speaking people, as disclosed by their history, is the realization of personal liberty.

The rights conferred and the duties imposed by what is sometimes called the law of persons, so far as they pertain to industrial affairs, may be grouped under the following heads: individual freedom, equality of opportunity, number and movement, and voluntary association.

a) *Individual freedom.*—A study of the growth of industry shows three conditions under which the great body of workers have been obliged to work:—first, that of slavery; second, that of serfdom; and third, that of freemen working for wages. The class of workers to whom this generalization applies are commonly called laborers, and that word will be used in what follows.

By contrast with the slave and the serf, the *laborer* of today is a workman who stands before the law as any other worker. If one must speak of laborers in the language of property, the modern laborer owns himself and the law does not permit him to part with that ownership. So far as the law is concerned, there is no labor class. All men are equal before the law. No man is compelled by law to be a laborer. This is our first important lesson.

When, however, one observes the situation as it is in the modern business world, he is obliged to recognize a labor class, and to acknowledge that this fact gives character to modern industry. The labor class of to-day is composed of freemen who work for wages. It is a wage earning class, and the peculiar fact respecting it is that laborers have no property in the instruments of production.

b) Equality of opportunity.—It lies in the theory of industrial law that all men shall be granted the same opportunity of industrial success. This is attained by the abolition of classes, so far as classes are recognized by law. In the modern world, no legal privilege is conferred by the accident of birth. There are no industrial rules which limit men in their choice of a place in industry. Every profession, trade, or line of business, opens its doors to the choice of industrial freemen. The industrial theory which springs out of this fact of law is that, through freedom of opportunity, society as well as individual workers will reap the highest possible benefits. It assumes that, under equal opportunity, every worker will do the best possible for himself, and that in so doing he will contribute in the highest degree possible to the well-being of all workers.

c) Numbers and movement.—Among the technical rights conferred by the modern system of law, are the right of marriage and the right of migration. The point here to be noted is that, in so far as numbers influence in any way the character of industrial society, the law refrains from exercising any control.

For the United States, this right of migration within the jurisdiction of the Federal government is guaranteed by the Constitution. Certain important results flow from this well-established fact. It gives what is termed mobility to capital and to labor. The distribution of industry throughout the country is determined by the choice of men who control the capital, and, consequently, what is termed the industrial development of the nation, so far as the spread of industry is concerned, is free from the dictation of the law.

The fact that laborers have the right to migrate from place to place carries with it another significant result. If wages are high in one locality and low in another, the tendency will be for laborers to migrate from the place where wages are low to the place where wages are high. This means that the labor market is nation wide. Not only does it tend to equalize wages between different parts of the country, but it makes it possible for industries to plant themselves where the natural conditions are the most inviting. For a variety of reasons, laborers do not readily move from place to place, but, so far as the law is concerned, the right of such movement is fully guaranteed. This,

also, is a fact of immense importance to the student who desires to understand modern industrial society.

d) *Voluntary association.*—An important corollary of industrial freedom is the right of contract. Workers of all classes are at liberty to enter into any industrial arrangement they may agree upon, provided such agreement is not contrary to the public interest. An important industrial fact is that the co-operation of workers, to which reference was made in the first chapter, is realized through the exercise of the right of contract. The right of contract is an expedient provided by the law in order that men may choose freely what they will do and how they will do it. All arrangements for co-operative work, whatever they may be, stand before the law as voluntary associations. They are associations entered into voluntarily by men who are free to make contracts.

Statutes imposing conditions of work.—In the foregoing discussion, attention was called to the fact that the results of industrial freedom as we see them to-day, do not in all respects harmonize with the idea that lies back of the legal system by which that freedom is conferred. This should not be the occasion of surprise. A system of law which confers equal opportunities upon men who are not equal in strength, in skill, or in the amount of education they are able to acquire, cannot produce equal results. Nevertheless, the purpose of the law is firmly held as the purpose for which government should strive, and it is the result of this striving that one reads in the industrial statutes of the day. There purpose is the elimination of the evils which spring from competition, and the subjection of the exercise of freedom to such restraints that equality of results, as well as of opportunity, may be realized, so far as this can be done without impairing the efficiency of work.

Three kinds of laws or groups of enactments may be named which hold this end in view. These are: laws which prescribe conditions, laws which provide for supervisory control, and laws which provide for administrative control.

Government as protector.—It is not correct to say that the government has no part in industry. On the contrary, a just and strong government is the most important single fact for the attainment of industrial success. History does not provide a single case of a flourish-

ing industry under a corrupt or weak government; but it furnishes many illustrations of fields unworked, and of industries falling into decay, because workers were deprived of the protection of strong and just governments. Government as a protector is an essential condition of an effective and progressive business community. It is in this sense that we include the protective function of government as a part of the legal framework of industry.

The protective functions of government of importance to industry are: protection against aggression from without, protection from violence within, and enforcement of contracts.

B. STATUTE LAW AND COMMON LAW[52]

We commonly speak both of law and of laws, and these terms, though not used with precision, point to two different aspects under which legal science may be approached. The laws of a country are thought of as separate, distinct, individual rules; the law of a country, however much we may analyse it into separate rules, is something more than the mere sum of such rules. It is rather a whole, a system which orders our conduct; in which the separate rules have their place and their relation to each other and to the whole.

There is also a more precise way in which we use this distinction between law and laws. Some laws are presented to us as having from the beginning a separate and independent existence; they are not derived by any process of analysis or development from the law as a whole. We know when they were made and by whom. Such laws in this country are for the most part what we call statutes; collectively they are spoken of as Statute Law. On the other hand, putting aside for the present the rules of Equity, the great body of law which is not Statute Law is called the Common Law. The Common Law has grown rather than been made. We cannot point to any definite time when it began; as far back as our reports go we find judges assuming that there is a Common Law not made by any legislator. When we speak of *the* law we are thinking of the system of law which includes both Statute and Common Law, perhaps more of the latter than of the former. A rule of the Common Law would rarely, if ever, be spoken of as *a* law.

[52] Adapted by permission from W. M. Geldart, *Elements of English Law,* pp. 7–13. (Henry Holt & Co., Williams & Norgate.)

In spite of the enormous bulk of the Statute Law, the most fundamental part of our law is still Common Law. No statute, for instance, prescribes in general terms that a man must pay his debts or perform his contracts or pay damages for trespass or libel or slander. The Statutes assume the existence of the Common Law; they are the addenda and errata of the book of the Common Law; they would have no meaning except by reference to the Common Law.

On the other hand, where Statute Law and Common Law come into competition, it is the former that prevails.

How do we know the law? Here there is a great difference between Statute and Common Law. A statute is drawn up in a definite form of words. On the other hand, we have no authoritative text of the Common Law. There is no one form of words in which it has as a whole been expressed at any time. Therefore in a sense one may speak of the Common Law as unwritten law in contrast with Statute Law, which is written law. Nevertheless, the sources from which we derive our knowledge of the Common Law are in writing or print.

C. LEGAL INTERVENTION IN BUSINESS[53]

Legal intervention in business analyzed.—A business man may be thinking of taking some action, or he may be inactive and someone may be trying to get him to act. To know whether the action contemplated or requested shall be taken requires that the business man know what rules of law are applicable to the act in question. After he has decided whether or not the action will be possible or profitable he must yet decide what the legal consequences of his acting or refusing to act will be. Depending upon the nature of the act involved, the law may say to him one of three things: (1) "You shall not do it." (2) "Do it or not, as you like. If you decide to do it, I will help you." (3) "You shall do it."

Prohibitive intervention.—The law often intervenes in affairs of men to prohibit certain acts and conduct. The thing prohibited may be so detrimental to the public if permitted that the public, through its organized representative, the state, labels it criminal and punishes the offender with death, imprisonment, or fine. The principal crimes have been classified as follows: (1) Offenses against the government,

[53] Prepared by Herman Oliphant.

including treason, bribery, extortion, maintenance, perjury, and contempt; (2) offenses against the public peace and welfare, including affray, riot, libel and slander, nuisance, and conspiracy; (3) crimes against religion and morality, including blasphemy, adultery, bigamy, and kidnapping; (4) offenses against the person, including assault, homicide, and robbery; (5) offenses against property, including arson, burglary, larceny, embezzlement, cheating, forgery, and counterfeiting. Those crimes of prime importance to the business man are: libel and slander, conspiracy, embezzlement, cheating, and forgery.

Besides conduct contrary to morals, that contravening public policy is condemned, though not of sufficient seriousness to constitute a crime. Reprehensible conduct, short of crimes, usually takes one of two forms: torts, or illegal contracts. Public policy requires the protection of certain interests. They may be the interests of the individual, of society as a whole, or of the state as a representative of society. The law intervenes if I insist upon mashing your nose or destroying your reputation by defamation. Marriage-brokers' contracts and contracts or gifts whose effects are to restrain marriage are not valid. I must not make a highway of your lawn or otherwise lessen the value of your enjoyment of any property that is yours. One cannot enforce a promise to pay a bribe or a contract to lobby for a legislative measure. The social interests which are protected are enormous in number and happily increasing. To take examples from a single field, that of economic interests, the body of law rendering futile contracts in restraint of trade is both enormous and adolescent, while, to the question what means are fair and foul in the bargaining struggle between employers and employees and in contracts between trade rivals, the answer which the law will finally return will doubtless be as complex as it is now uncertain.

There are many ways by which the law's disapprobation of conduct is expressed. The most obvious one is to give the public a remedy in the form of a criminal prosecution, as was done by the Sherman Act. More effectual, because put into the hands of the individual who has been harmed, is its civil action for damages. To enforce contracts, elaborate and expensive legal machinery has been provided. In a multitude of cases the law makes real its dislike of certain conduct by refusing the wrongdoer the use of this machinery.

Promotive intervention.—The second type of legal intervention is promotive in its purpose. To promote the exchange of commodities, for example, certain promises concerning it are sanctioned by the law and their performance is made obligatory. To promote commerce the law permits and aids a railroad to take private property with or without the owner's consent.

Incidentally for the good of the individuals concerned, but primarily for the good of society as a whole, the law sanctions among other things promises which people have procured. What promises the law by its sanction requires to be performed depends both upon their content and form. The promise must relate to something of general importance to be thus dignified by the law. In general, promises relating to trade and commerce are binding. Promises to dine are not. Promises to marry are. Again, I may want to make a promise to you without making myself liable to have to perform it. It is therefore desirable that we shall be able to make our promises binding or not as we wish. The difference is one of form. Unless the promise takes a certain form the law will not enforce it.

Ordinarily, I cannot be compelled to sell property which I own. It cannot be taken from me without my consent. Yet a corporation, in undertaking to build a bridge or a railroad, may need land which I own. To such corporations the law-makers may give the privilege of taking my land without my consent. A group of men desire to form a business organization that will continue though one of them dies, and for whose obligations the members will not be liable beyond the amounts which they have put into the business. These powers and privileges are often conferred by the legislature upon groups of individuals.

Mandatory intervention.—Over against the inhibitory functions of the law, which were discussed under the head of Prohibitive Intervention, stand its accelerative functions, less numerous, but no less interesting. Usually whether I shall enter into a contract with you is a matter solely for my determination. If I sell food, I may refuse to sell bread to X because his head is bald, to Y because he eats with his knife, or to Z because he believes in ghosts; and this though each is starving. I may sell at any price I please, and I may charge one man half the value of the bread while I charge another double its worth. I may close my shop whenever it suits my fancy to do so, for any rea-

son or for no reason at all. But if my business is that of a carrier of goods or passengers, or that of an innkeeper, or if I sell gas, water, or electricity instead of bread, ordinarily I may do none of these things. Upon persons or firms engaged in some businesses the law imposes affirmative duties that they shall deal with all proper persons who are willing to pay prices which the law has said are reasonable, and that they shall make no discriminations that are unreasonable. Such businesses, moreover, may not be forsaken at will. While in most businesses, the owners may fix the amount and kind of property which they use, the owners of railroads, for example, must if necessary buy more cars and engines. Telephone companies must lay more cables if the growth of the demand for telephones requires it. To enforce these affirmative duties imposed by the law two principal remedies exist: the person who has been injured by the failure of the owners to perform these duties may sue them and collect for his injury; or he may require some officer of the state, usually the attorney general, to bring action to compel the owners to perform their duties.

Promotive intervention is unlike prohibitive intervention in that it is always the purpose of the latter to prevent action, while the former contemplates action and change.

D. THE FIELD APPROPRIATE TO LAW[54]

The law is but one of various means of control.—There are other means of control such as religion, superstition, ethical teaching, public opinion, etc. Men use physical force, persuasion, education, social ostracism, boycott, blacklist, all sorts of economic, political, and social pressure—court, legislature, school, press, pulpit, platform, market, bank, factory, etc. in the effort to make other men do as they wish. Every man and every group of men is constantly striving consciously or unconsciously, effectively or ineffectively, to control the world in his or its interest. *The law molds human conduct by means of the organized application of physical compulsions to the persons or property of the people. It is a massive, external, tangible control.*

Law too costly to be used to enforce the whole moral law.—Which forms of control should be used in any particular case or class of cases depends on the nature and training of the persons to be controlled and

[54] Adapted by permission from Frank Parsons, *Legal Doctrine and Social Progress*, pp. 17–23. (B. W. Huebsch, 1911.)

the peculiar circumstances, especially in relation to cost, certainty, directness, definiteness, and practicability. It costs a great deal in time, money, and friction to set the cumbrous machinery of the law in motion and to carry it through to judgment and execution; to use that method of control for small offenses against the moral law, such as ordinary lying, explosions of ill-temper, common breaches of courtesy, etc., would be to incur far greater evils than those intended to be repressed. Such offenses should be dealt with by public opinion and the inner ethical control, which work with the minimum cost and the maximum of effectiveness.

The law draws the line at the average man.—It would be folly to attempt to use the law to punish the ordinary shortcomings of the average man. Any system of law that would make the mass of human conduct subject to suit or prosecution, or bring the mass of men into court, or make them liable to be brought into court, would be simply intolerable. The law may be used to punish the sins of our savage blood, to press the defective classes into shape, and bring the lagging minority up to the average standard. But the common sins of the average man should be left to education, public opinion, and the complex mass of family and social influences that are gradually molding human nature to higher and higher types. The law draws a broad line at the average level civilization has attained: it requires only good faith and due care, that is, the degree of honesty, care, and skill which an ordinary man would exercise under similar circumstances. It does not require the honesty, skill, and care exhibited by the best (a rule which would subject the bulk of mankind to legal liability and prosecution), but only demands the virtue of the man of ordinary character, intelligence, and care. The moral law requires of all the conduct of the best and more; but the civil law demands only the goodness of the average type.

The law waits for crystallized public opinion.—So again uncertainty as to the character of the act, or the proof of it, may bar the law as a remedy. Society is not yet agreed that the use of intoxicants (I am not referring to the organized liquor traffic), narcotics, or drugs, stock speculation, sensational journalism, or useless duplication of industries, stores, factories, etc., is immoral; the legal presumption is always with liberty till experience makes it clear, beyond a reason-

able doubt, that the conduct in question is against the interests of society. Till then the matter should be left to ethical discussion, to the pressure of public opinion and its allies.

The law enters only where proof is possible.—Where the facts are difficult of proof, the law is equally excluded. Neither is it adapted to deal with sins of envy, jealousy, overeating, vices of secret character, etc. In the field of evidence the law draws broad lines. It will not deal with evils that in their nature are generally incapable of clear proof. It puts up the bars against hearsay evidence. It requires a witness to tell what he knows of his own knowledge, not what he infers from what he has heard others say. It requires the best evidence the nature and circumstances of the case permit.

4. GOVERNMENT IN SOCIAL CONTROL

A. FUNCTIONS OF GOVERNMENT AS SEEN BY THE CLASSICAL SCHOOL[55]

All systems either of preference or of restraint being thus completely taken away, the obvious and simple system of natural liberty establishes itself of its own accord. Every man, as long as he does not violate the laws of justice, is left perfectly free to pursue his own interest his own way, and to bring both his industry and capital into competition with those of any other man, or order of men. The sovereign is completely discharged from a duty, in the attempting to perform which he must always be exposed to innumerable delusions, and for the proper performance of which no human wisdom or knowledge could ever be sufficient; the duty of superintending the industry of private people, and of directing it towards the employments most suitable to the interest of the society. According to the system of natural liberty, the sovereign has only three duties to attend to; three duties of great importance indeed, but plain and intelligible to common understandings: first, the duty of protecting the society from the violence and invasion of other independent societies; second, the duty of protecting, as far as possible, every member of the society from the injustice or oppression of every other member of it, or the duty of establishing an exact administration of justice; and, third, the duty of erecting and maintaining certain public works and certain public in-

[55] From Adam Smith, *The Wealth of Nations,* Book IV, chap. ix.

stitutions, which it can never be for the interest of any individual or small number of individuals to erect and maintain; because the profit could never repay the expense of any individual or small number of individuals, though it may frequently do much more than repay it to a great society.

B. MODERN STATEMENT OF THE FUNCTIONS OF GOVERNMENT[56]

The functions of the state may be classified as: first, those which are necessary; second, those which are natural or normal, but not necessary; and third, those which are neither natural nor necessary, but which, in fact are often performed by modern states. The last are described by some writers as "doubtful" functions.

1. What are called the essential, normal, or constituent functions are such as all governments must perform in order to justify their existence. They include the maintenance of internal peace, order, and safety; the protection of persons and property; and the preservation of external security. They are the original primary functions of the state, and all states, however rudimentary and undeveloped, attempt to perform them. They embrace the larger part of the activities of the state and have to do principally with the conservation of society and only secondarily with social progress.

2. By natural but unnecessary functions are meant those which the state may leave unperformed or unregulated without abandoning a primary duty or exposing itself to the dangers of anarchy, but which would be neglected, or at least not so well performed, by private enterprise. Among such functions may be mentioned the operation of the postal service; the construction of dikes, levees, canals, public roads, bridges, and irrigation works, and works of public utility generally; the maintenance of scientific and statistical bureaus; the erection and maintenance of lighthouses, beacons, and buoys; the construction of harbors, wharves, and other instrumentalities of trade and commerce; the care of the poor and helpless; the protection of the public health and morals; elementary education; the regulation of many trades, businesses, and occupations, which are affected with a

[56] Adapted by permission from J. W. Garner, *Introduction to Political Science*, pp. 318–20. (American Book Co., 1910. Author's copyright.)

public interest; and the conduct of various undertakings which would be unprofitable as private ventures, but which are required by the common interest.

3. Among the activities of the state which are neither essential nor natural, but which are not a matter of indifference to the public, and which are performed by some states as well as by private enterprise, and at less cost, there are a great variety of services, mainly economic and intellectual, such as: the conduct of railway traffic; the telegraph and telephone service; the manufacture and distribution of gas and electricity for lighting purposes; the furnishing of water for drinking and other purposes in cities; the maintenance of theatres, pawn-shops, bath houses and lodging houses; the encouragement of certain industries by means of bounties, protective tariffs, and subventions; the planting of colonies; the encouragement of immigration; the establishment of experiment stations, liquor dispensaries, banks, universities of learning, hospitals, reformatories, art galleries, museums, zoölogical and botanical gardens; the erection of improved dwellings for working people; the making of loans to farmers; grants in aid of railroads; the distribution of seeds for agricultural purposes; the conduct of the business of insurance; the granting of old age pensions; the maintenance of employment bureaus; and many other activities too numerous to mention. Under this head also may be included a great volume of regulatory or restrictive legislation dealing with the conduct of certain trades and occupations which are affected with a public interest, such as: railway traffic and means of communication; mining, manufacturing; the relations between employer and employees; the conduct of dangerous, offensive, or obnoxious trades; the censorship of the press, vaccination, quarantine, and sanitary legislation; laws regarding the erection of buildings in cities; laws regulating banking, barbering, baking, plumbing, pawnbroking, slaughtering, and many other trades or businesses.

The first group of activities described above represent, according to the individualistic theories, all the activities that the state ought to undertake. Anything more is superfluous and involves an infringement upon the rights and liberties of the individual and cannot therefore be justified.

C. THEORIES CONCERNING GOVERNMENTAL INTERVENTION[57]

What attitude must the government adopt toward the suffering and sorrow, the distress and poverty that everywhere abound? Many different answers are given to this question; but all of them may be reduced under five heads.

1. The first answer is that government, in the discharge of both its legislative and its administrative duties, ought simply to go on as it is doing at present. Evils should be dealt with piecemeal as they arise. In this view all *systems* are misleading. The only guide is common-sense. There is no use of making generalizations at all, for each evil has its own special causes, and must be considered by itself.

2. The second answer to the question is that of the Socialist—let the government step in boldly and undertake far more than it does at present—let it, in fact (say extreme votaries of this doctrine), regulate *everything*. The evils complained of are due in great measure to the free play of the unrestrained evil passions of individuals. Government ought, by force, if necessary, to hold these in check, and it would then become a kind of terrestrial Providence whose duty would be to remedy every ill that flesh is heir to. It would in particular supersede the evils of competition and the unequal distribution of wealth, by regulating all trade and industry by a central system of control. It would own all land, railways, machinery, and, in short, all property of every kind—leaving only the rights of use to the private citizen.

3. A third opinion is the direct opposite of this. Existing evils, which are by their nature remedial, so far from being curable by government intervention, are directly caused by it. Government has no business to meddle with things outside its proper province, and that is at best a very narrow one. In whatever direction the State carries its well-meant but fussy interference with private interests, it does harm.

4. The fourth view tries to distinguish between the provinces of the individual and of the State. The latter lies, as it were, round the centre of the circle, which each social atom has his individual sphere somewhere near the circumference. Thus, the respective fields of State-action and of individual-action are mutually exclusive. To say

[57] Adapted by permission from W. S. M'Kechnie, *The State and the Individual,* pp. 164–69. (James MacLehose & Sons, 1896.)

that anything is a matter for the individual to decide is, in this view, equivalent to saying that the government has no right or, at any rate, no business to interfere. A hard-and-fast boundary line exists somewhere, and the problem is to discover it.

5. There is yet another solution which rejects all these views equally. This fifth theory, then, asserts that no province can be found which is absolutely that of the State, in the sense of excluding individual action, while equally there is no province of the isolated subject which absolutely excludes the government. The individual finds his sphere to be no narrower than the State itself, while the sphere of the government may be logically extended to embrace all the interests and actions of every man and woman. This is the theory of organic unity, which holds it absurd to draw a line between two things whose essential nature lies in their connection with each other.

This fifth solution of the problem, which is here taken to be the only sound one, differs from all the others. It differs from the first in condemning the policy of mere drifting with the current, without formulating principles of guidance and without listening to the voice of science. It condemns the treatment of each case as an isolated problem, and the see-saw inconsistent policy that results—one thing straggling in one direction, while its fellow drifts in the other. Every act of policy must be ultimately judged by the final end of the State itself, and by those approved minor ends which political science has declared to be for the time consistent with, and conducive to, that higher goal. Thus a principle of order is introduced.

It also differs from the socialistic plan. For, though it concedes that the government *may* be lawfully and justly endowed with powers to do everything, it admits no absolute presumption in favour of community of property or of government interferences as opposed to private initiative.

It differs from Individualism in refusing to admit the truth of any philosophy which would find man's highest good apart from his fellow-men, and because it refuses to admit any absolute limits to the action of the central authority acting for the good of the whole.

It differs from those who would effect a compromise between the last two theories, because it cannot admit any distinct province of the man apart from the State. It does not look on the government and the

subject as two unconnected principles which approach each other from opposite sides, and it does not try to allocate the sum of human interests between them, settling by a contract or compromise that everything on this side of an imaginary line goes to the one party and everything on that side to the other.

See also:
"Mercantilism," page 236.
"The Mercantile Regulations Become Onerous," page 238.
"The Transition to Laissez Faire," page 239.
"The Natural Rights Philosophy which Lies behind Laissez Faire," page 241.
"Remedies for Certain Common-Law Doctrines, page 640.
"Social Insurance," page 644.
"Labor Legislation in One State," page 648.
"Some International Aspects of Labor Legislation," page 652.

5. RADIANT POINTS OF SOCIAL CONTROL[58]

A control that we have any right to call *social* has behind it practically the whole weight of society. But still this control often wells up and spreads out from certain centers which we might term *the radiant points of social control.* The question before us is: What is the ultimate seat of authority? Where resides the will that guides the social energies? Who holds the levers which set in motion the checks that hold a man back or the stimuli that push him on?

That frequently these checks and stimuli are managed by a rather small knot of persons should not for a moment lead the reader to confuse social control with class control. Totally different from class control in origin is the power of a minority to direct social control. *Social power is concentrated or diffused in proportion as men do or do not feel themselves in need of guidance or protection.* When it is concentrated it is lodged in that class of men in which the people feel the most confidence. The many transfer their allegiance from one class to another—from elders to priests, or from priests to savants—when their supreme need changes, or when they have lost confidence in the

[58] Adapted by permission from E. A. Ross, "Social Control," *American Journal of Sociology,* VI (1900–1901), 238–45.

old guidance. When they begin to feel secure and able to cope with evils in their own strength and wisdom, the many resume direction of themselves and the monopoly of social power by the few ceases.

Such is the underlying law of the transformations and displacements of power. The immediate cause of the location of power is prestige. The class that has the most prestige will have the most power. The prestige of *numbers* gives ascendancy to the crowd. The prestige of *age* gives it to the elders. The prestige of *prowess* gives it to the war chief, or the military caste. The prestige of *sanctity* gives it to the priestly caste. The prestige of *inspiration* gives it to the prophet. The prestige of *place* gives it to the official class. The prestige of *money* gives it to the capitalists. The prestige of *ideas* gives it to the *élite*. The prestige of *learning* gives it to the mandarins. The absence of prestige and the faith of each man in himself give weight to the individual and reduce social control to a minimum.

In some cases there exists an appropriate name for the régime. When the priest guides, we call it *clericalism*. When the fighting caste is deferred to, we call it *militarism*. When the initiative lies with the minions of the state, we call it *officialism*. The leadership of the moneyed men is *capitalism*. That of the men of ideas is *liberalism*. The reliance of men upon their own wisdom and strength is *individualism*.

Social control has about it a tinge that betrays the source from which it springs. When the reverend seniors monopolize power, much will be made of filial respect and obedience, infanticide will be a small offence, while parricide will be punished with horrible torments. Let the priests get the upper hand and chastity, celibacy, humility, unquestioning belief, and scrupulous observance will be the leading virtues. The ascendancy of the military caste shifts the accent to courage, obedience, loyalty, pugnacity, sensitiveness to personal honor, and the unrelenting pursuit of revenge. When the moneyed man holds the baton in the social orchestra, the keynotes will be industry, thrift, sobriety, probity, and civility. The mandarins and *literati* have no moral program of their own, but they are sure to exalt reverence for order, precedent, and rank. The *élite*, whatever ideal they champion, will be sure to commend the ordering of one's life according to ideas and principles, rather than according to precedent and tradition. For only by fostering the radical spirit can they hope to lead men into un-

trodden paths. We may, then, lay it down as a law that *the character of social requirement changes with every shifting of social power.*

G. The Form of the Business Unit

Our economic order has as basic assumptions private property, freedom of contract, individual initiative, and competition—all these assumptions being more or less accurately defined by society and all being subject to alteration by society. In terms of such basic assumptions, individuals have organized social resources for production. As time has gone on the individuals who have assumed the responsibility for handling social energy (have engaged in the process of organizing social energy for productive purposes and for their own pecuniary gain) have come to operate through certain widely accepted patterns of contractual relationships, have come to use certain institutions. It will facilitate discussion to call these patterns "forms of the business unit."

If we were to survey the many generations through which the forms of the business unit have been developing, we should see well-nigh continuous changes being made. In some cases these changes have been made in order to lighten the risks of the business man—of the individuals who, under our society, are responsible for the guidance of social energy in production. In other cases these changes have been made in order to facilitate gathering together in one business large masses of social energy—large capital. In other cases the motive for the change lay in the desire to secure a more effective method of organizing for management.

There is little use in trying to memorize the characteristics of the various forms of the business unit. Indeed, their characteristics cannot be sharply defined. There is no human being who can set forth precisely and at all points wherein an individual proprietorship differs from a partnership. A corresponding statement may be made of the partnership, the joint stock company, the corporation, and other forms. These forms shade off into one another. They are "containers" and elastic containers, at that. They are shaped and molded to meet business needs; business needs are not squeezed into cut and dried forms of the business unit.

Now this does not mean that it is a mistake to speak of business

units as being of various types or forms of organization. It does mean that we must be careful to remember that they are *flexible* types.

We shall proceed in our study of these types as follows: first, we set up some tests of the efficiency of the different forms of the business unit. Then we canvass *the more usual features* of the following quite incomplete list of forms of the business unit: the individual proprietorship, the agency, the ordinary partnership, the limited partnership, the partnership association, the corporation, the business trust, co-operative industry. Other forms of the business unit will be discussed in a later section, where we shall be particularly concerned with the devices used in modern society to concentrate control of social energy used for production.

The individual proprietorship will probably give us little trouble. All of us already have a considerable mass of general information concerning it. As for the other forms, in which there is association of two or more persons, we may the more readily thread our way through the maze of details if we bear in mind that the law, in its effort to give certainty to business relations, seeks to clarify two sets of relationships: (*a*) the relationships of the associates among themselves *(inter se)* and (*b*) their relationships to others (third parties). We shall find, as we go along, that part of this is cared for in the common law (this is markedly true of the agency and the partnership) and that another part has called for statute law as a means of making relationships certain.

Under the common law, an agent who acts within the scope of his authority binds his principal as truly as if the principal were himself acting. This means, of course, that unless the principal (or his agent) limits his liability when forming a contract, the liability is unlimited. Just here we have an explanation of some of the outstanding features of the partnership, for in the ordinary partnership all partners are principals and all are agents—there is "mutual agency" and unlimited liability for every partner.

Notice that this gives third persons dealing with a partnership a clear understanding concerning what to expect. Upon the one hand, unless these third persons are specifically warned to the contrary by the terms of the contract, they may hold all partners unlimitedly liable. Upon the other hand, the partners may contract among them-

selves in any lawful way concerning management and indeed concerning who will, *so far as they are concerned,* assume the position of first risk. But such agreements *inter se* will not operate to limit the claim of third persons unless the third persons are aware of the situation and consent thereto.

As time has gone on, certain rules of the game have been evolved by society with respect to what will constitute making third persons "legally aware" of certain matters, as for example limitation of liability on the part of some or all of the partners. Mainly, these rules have taken the form of statute law which sets forth that, under such and such conditions, any third person who deals with a given kind of business association does so with the understanding that there is limitation of liability. These conditions will be such as seem to the legislature wise. They may provide that the word "limited" shall be used after the firm name; they may insist that a record shall be set up in some county courthouse or in some state office; they may demand publication in newspapers concerning the organization of such a company; they may do any reasonable thing by way of giving warning to third persons, and what is actually done varies from state to state. There is no use trying to memorize details. What the law seeks to accomplish is that third persons shall have "due notice" and the legislature is, speaking broadly, the judge (within reasonable limits) of what constitutes due notice.

What has just been said is as true of the corporation as it is of the various forms of the "limited" partnership. In the corporation, however, a new element comes to the front. As we know, the law makes an artificial person of the corporation and those associated in such a venture have their relationships *inter se* fixed, not by contracts among themselves, but by their contracts with this artificial person. Again, as we know, these contracts are ordinarily worked out through those devices we call stocks and bonds. This artificial person then deals with "third parties" and it is *unlimitedly liable* to these third parties unless its liability is limited in its contracts with these third parties. It is the *liability of the owners* which is limited and the extent to which it is limited depends upon the terms of their contracts.

Perhaps it is worth while to summarize what has been said thus far in a series of propositions.[58a]

1. The form of social control of prime interest to us in connection with our study of the form of the business unit is law, which is of two main kinds, (*a*) common law and (*b*) statute law.

2. Since the individual proprietorship (in its pure form) means that there is but one person responsible, the law involved in his case has to do with his relations to others. It is largely common law.

3. In those forms of the business unit where there is an association of two or more persons, the law is concerned with two matters: (*a*) the relationships or the rights, duties, and obligations of the associates *among themselves (inter se)*; (*b*) their relationships *to others* (third persons).

4. In theory at least, the law seeks to promote the welfare of society by giving "certainty" to these relationships so that all concerned may proceed about their affairs with confidence.

5. These relationships are in very large part contractual (the expression "this is a society of contractual relationships" ought to be assuming a large meaning), and they may accordingly have almost infinite variety. Just what these relationships shall be (1) depends upon the terms of the contract and (2) that depends upon the law of the land.

6. The forms of the business unit which have actually come into common use have arisen as means to the accomplishment of certain business ends. They can be better understood when studied with this in mind. It is of little value to try to memorize a list of these forms and the attributes applicable to each. Instead, try to realize that the forms are varying methods of fixing relationships (1) *inter se* and (2) with third persons.

7. Many puzzling details cease to puzzle if you keep in mind that one outstanding problem is that of letting third persons know the rights, duties, and obligations of those with whom they are dealing. Of course it *could* be done by having every such "deal" covered by a contract setting forth the whole story. This would be cumbersome,

[58a] A detailed set of questions in connection with these propositions may be found in *Outlines of the Economic Order*, pp. 86–90. (University of Chicago Press.)

however, and instead we commonly resort to some scheme of "public notice" of the situation, and after that notice has been given, third persons are assumed to know the situation, and to govern themselves accordingly. This statement applies particularly to "limited" partnerships and to corporations.

1. THE TESTS OF EFFICIENCY OF FORMS OF THE BUSINESS UNIT[59]

What have been the tests of efficiency which have determined the development and survival of the different forms of business organization? What are the tests for judging their relative efficiency to-day? The general test of economy is too indefinite for easy application. We may subdivide it into some five or six more particular and specific tests, as follows:

1. *Facility of formation.*—At the outset, the question of the ease of setting up in business differentiates one form of business organization from another. Aside from the question of raising capital, which is to be made a distinct test, there are questions of suitable associates, of expense, legal restrictions, etc. The problem of promotion is a big one nowadays, and one of the promoter's usual duties is to devise a suitable organization for his enterprise.

2. *Amount of capital.*—With the growing importance of capital in production, it has become increasingly essential that the form of business organization shall be one that facilitates the acquisition of large amounts of that factor. To this end it must afford a maximum degree of security, and appeal widely to the investing class. To be sure, where small capital is required, other tests may decide, but the preceding statement holds for industry as a whole.

3. *Liability.*—Closely connected with the subject of capital is the liability point. Risk is one of the chief elements in all business, and the form which will reduce risk to the minimum will most appeal to business men, when other things are equal. A certain amount of liability is essential in order to secure a proper motivation and direction of industry, and to insure those who deal with the business organization of fair treatment; but any greater liability than will attain these

[59] Adapted by permission from L. H. Haney, *Business Organization and Combination*, pp. 35, 36. By permission of the Macmillan Company, publishers (1904).

ends is undesirable from all points of view. Liability may be of two kinds: financial and legal. The former concerns economic responsibility in case of insolvency; the latter concerns juristic responsibility for criminal and civil offenses.

4. *Direction.*—Assuming that the capital has been raised, what efficiency will the form of organization, within which it is combined with the other factors, afford? The test of effective direction is in reality to be reduced to several subordinate tests. First, there is motivation, which concerns the intensity and directness of the stimulus to business activity. Then there are economy of operation, continuity of policy, flexibility of organization, to mention the more important points. By flexibility is meant adaptability to changing conditions, such adaptability being needed now for capital, now for membership, and again for centralization of management.

5. *Endurance and stability.*—The degree of permanence of the various forms of organization varies considerably, and this is a matter of no small importance. It is important to the individual to be able to lay business plans for the future and to make investments running for considerable periods of time. To the society it is important that some agency should exist for continuing in uninterrupted life the undertakings upon which its members depend for the satisfaction of their economic wants. In order to satisfy these needs the organization must both be able when undisturbed to last through a long period of time, and also to resist temporary disturbing influence, that is, be stable.

Finally, (6) a *legality* test may be mentioned. In every civilized society there is a changing body of legal rules which must be observed if the form of organization is to be most effective. A form of organization like the trust, for example, is obviously inexpedient because of legal conditions. Thus the law reacts upon economy. Indeed, from the association standpoint the various forms of business organization are, as such, children whose father is economic expediency and whose mother is the law.

That the foregoing tests may be applied both from the point of view of the individual—the "private point of view"—and from the point of view of society—the "public point of view"—must ever be borne in mind.

2. THE INDIVIDUAL PROPRIETORSHIP, THE PARTNERSHIP, AND THE CORPORATION[60]

In an individualistic competitive economic society every competent individual of mature age is a potential entrepreneur. Each person is in varying degree awake to the voicings of demand for consumable goods. There is no ear on which these fall wholly without answering resonance.

The potential enterpriser, having decided to what end he will undertake to direct social energy, looks about for ways and means. There are chiefly three ways in which the enterpriser may launch his business. They are these:

1. He may become an individual organizer or entrepreneur.
2. He may join in a relation with other persons, called a partnership.
3. He may decide that his business should be conducted by a corporation.

There are some advantages and disadvantages in each of these forms of business organization from the standpoint both of the entrepreneur and of society as a whole. We shall consider the three types in order.

1. *The individual entrepreneur organization.*—A first advantage of the individual entrepreneur organization is the ease with which it may be formed and terminated. To start in business it is not necessary to go through any formalities. One may begin with any kind of business. He may start any time he thinks he can do so profitably, and may stop without consulting anyone but himself.

A second advantage which the individual finds in going into business alone is that if there are profits he takes them all. If he is capable and energetic he is likely to be successful, and can keep for himself all the results of his ability and industry. His management is likely to be definite and coherent in its policy, and will never suffer from a variety of counsels.

In some ways society also gains by having individual entrepreneur organizations. Men who know that their chances of success or failure depend on themselves will work hard. The chance for gain is a strong incentive. This means, if they are capable, increased produc-

[60] Prepared by L. S. Lyon.

tion of goods, which of course means that there will be more for society to consume. Society also profits from this type of organization because these people are being constantly educated in business management. Lured by the prize of profits, threatened by the rod of failure, they are diligent in learning to direct more and more social energy for society's benefit.

There are, of course, disadvantages in this form of organization. If a man goes into business alone he makes all the profits, but if there is a loss he has no one with whom to share it. Besides this, he has always to rely mainly on his own judgment. Management is limited in breadth of view. The enterpriser has no one who is really interested in his business with whom to consult. Limitations in capital are also apparent. The amount of money which he can put into his business is limited by his personal fortune and his credit. It may be that there will be times when he could make large profits if he had more funds, but he is unable to supply them. At such times he is likely to wish for a partner. The final disadvantage in this form of business, as the entrepreneur views it, grows out of the fact that there is no distinction between his business liabilities and assets and his personal liabilities and assets. He is unable to take the risks of business with part of his money only. If his business fails the receiver will utilize "personal property" as well as "business property" in satisfying creditors.

The Individual Proprietor

has relationships, and especially contractual relationships, with

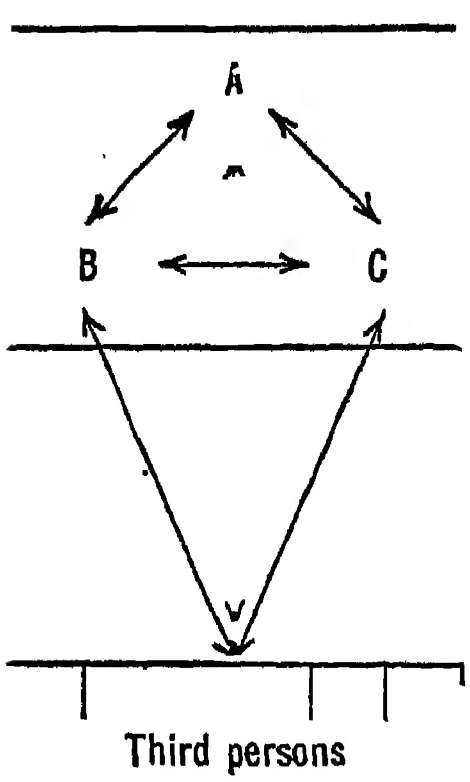
Others

2. *The partnership.*—Suppose that, instead of going into business alone, the enterpriser joins with two or three others, agreeing to divide the profits and losses. Although men may be, and often actually become, partners by implication, partnership is usually based upon a simple oral or written agreement. The legal relationship arising from their agreement to transact business in this way is called a partnership. The partners together are usually spoken of as a firm. The partnership brings with it changes in management and ordinarily of capital. The management generally rests with all the partners and, though by no means necessary, all may invest capital.

From what has just been said of the individual entrepreneur, it is easy to see why the partnership should arise. When business began to

be transacted on so large a scale that one man did not have sufficient capital to conduct the business alone, and when business became so specialized that one man was not likely to know everything about every phase of the business, the partnership became a valuable institution.

From the standpoint of the individuals concerned it is valuable because, though each of them has only a small amount of money, they may, by combining, have enough to carry on an extensive business. One of them may be a specialist and expert in managing a small manufacturing plant. The other may be an able salesman, and, by combining the ability of both, they are able to manufacture goods and sell them to advantage. Neither has the partnership necessarily lessened the driving motives. Reward still depends on success. Profits will still be closely related to endeavor.



Partnership Relationships

Notice that the partners are within the rectangle. Compare this diagram with the diagram of a corporation. There the owners are *outside* of the rectangle.

It is easy to see that this institution of partnership is a good type of business organization in each of these cases, from the standpoint of society as well as from the view of the partner. It makes good use of social energy.

As the entrepreneur views the matter, there are some disadvantages and limitations connected with the partnership. The first is that the amount of capital, although fairly large, may be insufficient. Even by joining their money the two or three or more persons may not have secured enough to carry on the business which they have undertaken. The discussion of other disadvantages will reveal why the number of persons in a given partnership must be somewhat limited.

A second group of difficulties grows out of the new elements in management. One of these is a certain degree of inflexibility. Policies cannot be so easily modified and fitted to new conditions as they can be where one individual is in command. Lack of harmony in management may easily grow out of the responsible relations of partnership where viewpoint and opinion vary.

Another objection to partnership, which comes from the widened management, is a certain amount of instability. The partnership may undergo dissolution from a number of causes. Some of these it is beyond the power of the firm to prevent. The bankruptcy of a partner or his death will ordinarily cause a dissolution of the firm. Unless there is an agreement to the contrary, one party may withdraw or sell his share and thus bring about a dissolution. Even though an agreement may exist, one partner may withdraw if he cares to undergo an action for damages. Any of these things occurring at certain times might be disastrous to the welfare of the firm.

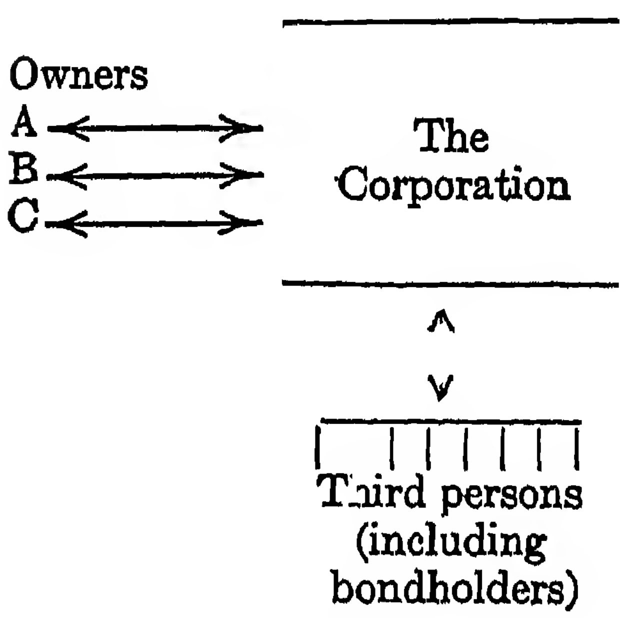
A final disadvantage which the entrepreneur sees as arising from the broadened management is a new element of risk and responsibility. This grows from the legal fact that each partner is, in all ordinary affairs, an agent for the firm. Each partner may, in matters that relate to the general business of the firm, make contracts binding on the firm. This becomes a serious consideration in view of the liability of partners. The obligations of a partnership are the joint obligations of its members—that is, the action to enforce it is brought against all jointly. But, although the creditor brings an action for his debt against all the members of the partnership jointly, he may satisfy his judgment out of the individual property of one partner, and is not bound to levy upon the joint partnership property.

It is obvious that this obligation for debts makes partnership a form of business organization into which a man will go only after a careful consideration of the type of men with whom he is joining. From this great liability for debts, however, arises one additional advantage to the partnership form of organization. This is the ease with which a partnership can borrow money. People are willing to lend where the liability reaches so far.

3. *The corporation.*—It should be needless, in discussing the corporation, to clear the mind of such dusty impressions as the notion that a corporation is necessarily a large and usually a vicious organization. Many corporations are capitalized for only a thousand dollars, and the American Bible Society and several boards of foreign missions find it convenient to transact their business through the corporate form.

The corporation, like the individual organization and partnership,

is simply a type of business organization which has grown up because society needed it as a device through which social energy could be effectively directed in satisfying wants. A corporation is sometimes defined as an artificial entity, created by statute law under a special name, with the liberty of perpetual succession, acting in many respects as an individual. The point to be held clearly in mind is this, that the corporation is a separate person. Nine persons in a room, to use a common illustration, form a corporation. There are then ten individuals in the room. A corporation is a distinct legal entity, separate from the people who compose it.



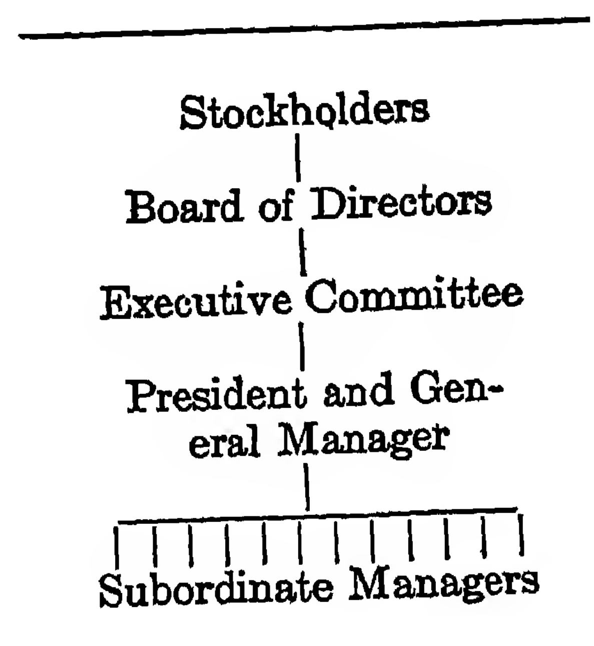
CORPORATE RELATIONSHIPS

Some of the advantages of the corporation are quite obvious. Most notable of these perhaps is the readiness with which it adapts itself to the raising of large amounts of money. Shares of ownership in corporations may bear a face or par value set at prices ranging from hundreds of dollars to a few cents. There is ordinarily no limit to the amount for which a corporation may capitalize, and no limit in either direction to the amount an individual may subscribe to the capitalization provided he is willing to subscribe for at least one share. It thus becomes possible to interest many persons and to accumulate gigantic sums of money.

If the individual who is contemplating the formation of a new business has in mind an undertaking which will require a great deal of capital the corporation plainly lends itself to his needs. In the matter of capital possibilities the corporation is no less advantageous to society. It is not enough to say that such vast undertakings as railroads, steamship lines, and large manufacturing plants would have been difficult without the corporate type of business organization. It is not too much to say that the whole new technology, which was the wonder of the nineteenth century, and which was made possible by the scientific discoveries of the earlier centuries, would not have been so quickly and so fully available to man had it not been for the corporate type of business organization. In several other ways society

finds advantage in the capitalizing methods of the corporate form. The small savings of many people are brought into productive use. These might lie idle were it not for the possibility of investments of small amounts.

As the individual views the corporation it has a further advantage in the matter of liability, an advantage which also reflects favorably upon the amassing of capital. Ordinarily there is no liability or chance for loss beyond the amount invested in the stock of the corporation. The debts of the corporation, being those of an artificial but distinct personality, are quite separate from the property of the individual shareholders. Now it should be noticed that there is nothing here in the law that is new or that is more favorable to corporations than to private persons. The corporation is absolutely liable to the extent of all of its assets for all of its debts. But the corporation is an individual. The people who own shares are no more the corporation than they are each other. Thus their property cannot be applied to the obligations of the corporation. National banks, where double liability attaches, are the principal exception to this rule. The advantage of this situation to society as a whole is somewhat more doubtful. Complaints that responsibility cannot be located, and that reckless action has often been taken by corporations because of this limited liability, are not uncommon. So far as the limited responsibility leads to unwise direction of the social energy under control these complaints are a justifiable objection to the corporate form. It must be recognized, however, that those who deal with corporations are generally fully aware of this limited liability and guide themselves and grant credit accordingly. It must also be recognized that this limited liability has been of tremendous benefit in drawing the money of investors into profitable enterprise.



Possible Organization of a Corporate Business

A final consideration in viewing the corporation as a type of business organization is its scheme of management. Control is usually vested in the stockholders in proportion to the number of shares which

they own. Frequently only stockholders of a certain type, as the holders of preferred stock or of common stock, may have the right to vote. This control is almost invariably turned over to a board of directors who may delegate it in turn to an executive committee, who may re-delegate it to a general manager. Where the interests of the corporation are large it is usually possible and profitable to secure the most able managers. If managers are not good it is easy to remove them. It is interesting in this connection to compare the difficulty and friction of removing or changing the management of a partnership.

3. AGENCY AS AN ORGANIZATION DEVICE[61]

One of the most significant, pervasive, and, perhaps, obvious facts in the study of modern society is the well-nigh universal utilization of agency as an organization device in the conduct of business. So universal is this fact that it can scarcely be more than an interesting speculation to inquire how far business activities are carried on by those acting in representative capacities.

Agency is a basic principle underlying all forms of business association. The nature and characteristics of partnership, joint-stock companies, and corporations can be understood only in terms of this fundamental hypothesis that one person can act for and in the place of another. Each of the organization devices, of course, is marked by features more or less peculiar to itself; but in the final analysis each is based upon the relation of principal and agent.

The objects for which an agency may be formed are almost as unlimited as human activities. There are in fact relatively few things which cannot be done as well through an agent as in person. Unlawful undertakings, commission of crimes, the doings of acts contrary to public policy, cannot be legally delegated to an agent; certain acts, very personal to one, such as voting, taking an oath, or entering into the marriage relation, cannot be performed through an agency; and as a general rule delegated authority cannot be re-delegated.

The formation of an agency is on the whole a fairly simple and non-technical transaction. The relation arises out of a voluntary agreement of the parties and is not ordinarily imposed upon them without their consent. It may be expressly made or it may be left to

[61] By W. H. Spencer.

implication. It may originate in a contract or it may result from a gratuitous promise of the agent. The constitution of another as an agent need not be evidenced by any writing in the absence of a statute requiring written evidence. Where an agency does arise out of a contract, the usual principles of the law of contracts, with reference to the capacity of parties, mutual assent and consideration apply. The main consideration in the creation of an agency at least from the principal's point of view is a careful delineation of the powers of the agent.

The agency relation has for its main purpose the carrying of the principal to a third person through the medium of the agent. Its operation is, therefore, tripartite; its operation always affects three different parties and produces, therefore, three distinct groups of consequences: (1) consequences as between the principal and the agent; (2) consequences as between the principal and the third person; and (3) consequences as between the agent and the third person.

1. As between the principal and the agent, on the one hand, there is a series of duties which the principal owes to his agent by reason of the relation.

On the other hand, there is a series of duties which the agent owes to the principal. The agent is under a duty to obey all instructions which his principal may impart to him. He owes a duty to the principal to exercise a reasonable degree of care and prudence in the performance of his duties. It is said, however, that an agent who undertakes to serve a principal gratuitously is under a duty to show only a slight degree of care in the exercise of his authority. The agent is under a duty to manifest a high degree of good faith in all of his dealings with his principal and on his behalf.

2. What now are the consequences of the operation of the agency relation as between the principal and a third person? In general it may be said that the principal is bound by every act and contract of the agent within the scope of the latter's authority. Stated negatively, the principal is not bound by acts and contracts which are outside the scope of the agent's authority. It is impossible in this connection to indicate in detail what is included in the phrase, "the scope of the agent's authority." Speaking broadly, however, the scope of the agent's authority, in the first place, includes all of those powers which the principal expressly confers upon the agent and subjectively in-

tends that he shall exercise; it includes, in the second place, any power which the principal leads the third person reasonably to believe that he has conferred upon the agent.

3. Now as to the consequences of the operation of the relation between the agent and the third person. The general rule is that the principal and the principal alone is bound by contracts which the agent makes within the scope of his authority. However, there is one very important exception to this general rule: If the agent, as is frequently the case, fails to disclose his principal, the third person may at his election hold the agent or the principal, when he is disclosed, on the contract.

If the agent exceeds his authority in making a contract, the principal is of course not bound by it; nor is the agent bound by it because the contract does not purport to be with him. What protection has a third person under such circumstances? If the agent knowingly and intentionally exceeds his authority, the third person may hold him in damages for fraud; if the agent innocently exceeds his authority, the third person in some cases may hold him liable in damages for a breach of an implied warranty of authority. Otherwise, the third person deals with an agent at his peril and must assume the risk of the agent's exceeding his authority.

The relation of principal and agent may be terminated in one of several ways. The relation is the result of an agreement of the parties to it and may always be changed or terminated by a subsequent agreement of the parties regardless of the content of their original understanding. An agency created for a definite time terminates upon the expiration of that time; an agency for a specific object comes to an end upon the accomplishment of the object. A gratuitous agency may be terminated by either the principal or the agent at will. An agency, even when it arises out of a contract, may be terminated by the act of either party: The principal may revoke the agent's authority or the agent may renounce his agency. In either event, however, the act terminating the relation is a wrongful act, a breach of contract, for which the injured party is entitled to recover damages. The relation is generally cut short by the death or the insanity of either the principal or the agent. The relation is similarly affected by the bankruptcy of either principal or agent as to matters involved in the bankruptcy proceedings.

4. DEFINITION AND GENERAL NATURE OF JOINT STOCK COMPANIES[62]

[The student should notice that in many jurisdictions these companies, also, are regulated by statute, although "the association is based upon the common law right of the members to contract with one another."]

A joint stock company may be defined as an unincorporated and voluntary association formed for the purpose of profit, having a common name, possessing a common capital contributed by the persons composing it, which capital is divided or agreed to be divided into shares of which each member possesses one or more, and which represent the interests of the members, and are transferable by the owner without the express consent of the other members or the creditors of the association. "Joint stock companies may be cited as quasi corporations of a private character. They are associations having some of the features of an ordinary common-law copartnership, and some of the features of a private corporation." Those definitions in which a joint stock company is denominated a partnership, contemplate the individual liability to third persons imposed by the law upon the members of the association, rather than the nature of the company in respect to its formation, the management of its affairs, its duration and dissolution which are among its distinctive characteristics.

From the preceding definitions we may deduce the following observations concerning the general nature of joint stock companies.

a) Such a company owes its existence to the contracts of its members as set forth in the articles of association by virtue of which it has a valid legal entity under the common law, with a right to extend its existence as the parties forming it may see fit to provide in such agreement. But they are largely regulated by statute in many jurisdictions.

b) As between themselves, each member of an unincorporated association, after all the assets of the company are exhausted, is bound to pay his proportion of the debts of the concern; but as to the creditors each member is liable for all such debts, no matter what the private arrangements among the members may be.

c) The association has a common name, which is usually descriptive of the business for which it is formed and does not consist of the

[62] Adapted from Scott Rowley, *The Modern Law of Partnership*, II, 1417–20. By permission of the Bobbs-Merrill Company, Copyrighted, 1916.

names of persons. In this name it may enter into contracts in the manner prescribed by the articles of association, and may generally sue and be sued under that name.

d) The capital of the company is divided into shares, and the number of shares held by each member determines his interest and the extent of his control of the management, and as between the members themselves fixes his proportion of liability for debts of the association. Ordinarily these shares represent a certain amount of money, or the value of property transferred to the company by the shareholders.

e) The shares are transferable at the will of the owner, or at his death become assets of the estate in the hands of his personal representative.

5. LIMITED PARTNERSHIPS AND PARTNERSHIP ASSOCIATIONS[63]

[The reader should observe that statute law is called upon to make these associations possible. Third persons must have their "due notice" of limitation of liability.]

A limited partnership is a partnership in which the liability of some of its members to bear any losses the partnership may sustain is limited to a defined amount, while the liability of its other members is not so limited. It must at all times consist of at least one general partner to be answerable to the public under the law for all the obligations of the partnership and at least one partner whose liability is limited to the sum contributed by him to the firm at its organization or to some amount provided by the statute. It is therefore properly based only on the existence of a general partnership and its general partners have the same rights and incur the same liability that members of a general partnership incur, but their duties are even more burdensome since they are deprived of any assistance from the limited members. The liability of a limited partner is generally limited by the statute to the amount he has contributed to the partnership at its formation. However, in some states his liability is fixed by statute otherwise.

Such partnerships in some respects partake of the nature of corporations; they can only exist where authorized by statute and the lia-

[63] Adapted from Scott Rowley, *The Modern Law of Partnership*, II, 1370–76. By permission of The Bobbs-Merrill Company, Copyrighted, 1916.

bility of some of their members is limited like the liability of stockholders in some kinds of corporations; their business is to be conducted by the general partners, while the business of a corporation is to be conducted by its board of directors. But this distinction must always be kept in mind: the directors of a corporation are selected by the stockholders and may be changed by such stockholders, while the general partners in a limited partnership are not selected by the limited members nor can they be changed by them. A corporation is an artificial person and constitutes a legal entity, and its stockholders may transfer their stock, while a limited partnership, aside from its members, does not become a legal entity and generally its members may not change except upon dissolution and reorganization under the statute.

[There is no need of detailed discussion of the so-called *partnership association.* Its fundamental difference from the "limited partnership" is that in the "association" all the partners have limited liability. It is apparent that this is possible only by giving "public notice" to third parties and that accordingly a statute will be passed setting forth the conditions under which such "associations" may operate.]

6. SIMPLE BUSINESS TRUSTS[64]

When the word "trust" is mentioned, most men at once think of some illegal combination. The term is in bad odor. Yet if one were to inquire of a lawyer concerning trusts one would probably be told that they are very desirable social institutions, and that they are perfectly legal. Moreover, in the conservative state of Massachusetts, one could find scores of harmless business organizations which are carried on under the trust form.

The simple business trust is a form of business organization under which the legal title to property is vested in an individual trustee or individual trustees. (Corporations may act as trustees, as is the case with trust companies. In such cases, the trust is the function; the organization is a corporation.) The property is managed by them in the interest of the former title holders who become "beneficiaries" (*cestuis que trustent*). The trustees thus become, not agents—as are partners

[64] Adapted from L. H. Haney, *Business Organization and Combination,* pp. 117–27. By permission of The Macmillan Company, publishers (1914).

—but principals; and they can make contracts, and can sue and be sued in their own names. The beneficiaries, in turn, are neither partners nor agents. They cannot convey the property to others; nor can they usually maintain any action at law for its protection. They only have the right of action against the trustees. With such a relation existing between trustees and beneficiaries, it is apparent that without any special provision to the contrary the debts of the business lie against the trustees, not against the beneficiaries.

Under the common law, trustees may and do issue certificates of beneficial interest, the capital embraced in the trust being divided into shares. These certificates are much like the stock certificates of a business corporation.

7. THE COÖPERATIVE[65]

The coöperative organization may take the form of a *corporation with capital stock, a corporation without capital stock,* or of a *simple membership association.* The essential idea of all coöperatives however organized is *management in the interest of those who do business with or through the association rather than in the interest of those who furnish the money to start the enterprise.* Thus in a coöperative association for selling live stock, the proceeds from the sale of the live stock over and above the actual expenses connected therewith are all prorated back to the individual farmers furnishing the live stock. There are no "profits" to distribute. The service is rendered at cost, and each member pays exactly for the service which he receives. If the organization needs capital, it may borrow it on the joint security of all the members, or may sell shares of stock to the members. If the latter plan is followed, the organization becomes a capital-stock coöperative corporation. The other essential idea of coöperative organization is democratic control by the members. In the membership association and the non-stock corporation, this is secured without any special arrangement—each member can have but one vote; in the capital-stock coöperative, it is secured by allowing each member one vote regardless of the number of shares he owns. To make democratic control still more certain, the number of shares that one member may own

[65] J. D. Black, *Introduction to Production Economics*, pp. 505–9. (Henry Holt & Co., 1926.)

is usually limited in the by-laws. It is ordinarily said that the three cardinal requisites of a true coöperative corporation are the *limiting of voting to one vote per member, limiting the dividends on stock,* and *limiting the number of shares that one person may own.*

The coöperative type of organization has a number of advantages which make it especially adapted to certain types of business situations, and which account for the remarkable swing toward coöperation in certain fields.

1. The members of a coöperative marketing organization feel more certain that they are getting all that their produce is worth than they would if they sold to a private buyer.

2. Because of the foregoing, farmers will deliver more produce to a coöperative enterprise than to a private one. They are willing to give a coöperative enterprise a monopoly of their business, but not a private buyer. Hence coöperative organizations tend to grow larger than their proprietary competitors, and to have lower handling costs in consequence.

3. Members of coöperatives are more easily interested in improving the quality of their produce than are the customers of a private marketing business. They feel more certain that the extra prices received for better quality will be reflected back to them. More important than this, a large coöperative organization, having under contract the product of several thousand members, can safely undertake to educate its members in improving quality.

4. The larger volume of product under one management makes possible many of the economies of large-scale production which will be pointed out in a later chapter.

5. The members of a coöperative are joint managers of their organization in a much more real sense than are the stockholders in an ordinary corporation.

It will be noticed that all of the advantages grow out of the essential nature of the coöperative type of organization—democratic control by and in the interest of the members.

But there are a number of important weaknesses of coöperatives traceable to the same source: the most important one is that too democratic control sometimes handicaps the central management in carrying out good business programs. The members are too poorly in-

formed in business affairs to make wise decisions; but they make them anyway in spite of the counsel of their officers and those who are most closely in touch with the business situations.

Although the coöperative type of organization is much more prevalent in the marketing of farm products than anywhere else, this need not always be the case. There is every indication that business units of many other types will combine increasingly into coöperative organizations.

8. RELATIVE IMPORTANCE OF THE MAIN FORMS OF THE BUSINESS UNIT[66]

One of the striking features of the evolution of modern industrial society has been the development of the corporation. The statistics in this field are of such very recent origin that, except for the last few years, no quantitative study of the growth of this form of organization can be presented which can lay any claim to accuracy. From the United States Census we find that, during the decade 1899–1909, the fraction of the mineral output produced by corporation-owned mines increased from about 85.0 to 92.2 per cent, while, in the manufacturing field, during the same period, corporations increased their share of the value added by manufacturers from approximately 63.3 to 77.2 per cent. We know that transportation by water, rail, and wire has been mainly carried on by corporations for several decades. In commercial enterprises, the general impression is that the stock company is gradually playing a more important part than formerly. Only in the field of agriculture does the individual entrepreneur—the man who controls and directs his own business—still remain dominant and almost without corporate rivals. A rough estimate indicates that, of the total products of American industry in 1899, some 39 per cent or approximately seven billion dollars' worth, and, in 1909, about 44 per cent, or thirteen billion dollars' worth, were turned out by corporation-owned plants.

[66] Adapted by permission from W. I. King, *The Wealth and Income of the People of the United States*, pp. 208–11. (The Macmillan Company, 1915.)

9. THE CHANGING FORM OF THE BUSINESS UNIT IN MANUFACTURE[67]

Coincident with the development of the factory system and the enlarged scale of production has come a change in the legal organization of industrial enterprises.

ESTABLISHMENTS, WAGE EARNERS, AND VALUE OF PRODUCTS, BY CHARACTER OF OWNERSHIP: 1904 TO 1919

Character of Ownership	Establishments		Wage Earners		Value of Products	
	Number	Per Cent Distribution	Number	Per Cent Distribution	Amount in Millions	Per Cent Distribution
All classes:						
1904	216,180	100.0	5,468,383	100.0	$14,794	100.0
1909	268,491	100.0	6,615,046	100.0	20,672	100.0
1914	275,791	100.0	7,036,247	100.0	24,246	100.0
1919	290,105	100.0	9,096,372	100.0	62,418	100.0
Individuals:						
1904	113,946	52.7	755,923	13.8	1,703	11.5
1909	140,605	52.4	804,883	12.2	2,042	9.9
1914	142,436	51.6	707,568	10.1	1,925	7.9
1919	138,112	47.6	623,469	6.9	3,536	5.7
Corporations:						
1904	51,097	23.6	3,862,698	70.6	10,904	73.7
1909	69,501	25.9	5,002,393	75.6	16,341	79.0
1914	78,152	28.3	5,649,891	80.3	20,183	83.2
1919	91,517	31.5	7,875,132	86.6	54,745	87.7
All other:						
1904	51,137	23.7	849,762	15.5	2,187	14.8
1909	58,385	21.7	807,770	12.2	2,289	11.1
1914	55,203	20.0	678,788	9.6	2,138	8.8
1919	60,476	20.8	597,771	6.6	4,137	6.6

Ownership prior to 1914 was reported under four headings, "Individuals," "Corporations," "Firms," and "All others." For the purpose of this study the last two classes are combined. The group "all others," therefore, is made up chiefly of establishments operated by firms, but includes cooperative associations and miscellaneous forms of ownership that could not be classed as "individuals" or as "corporations." As can be seen from the table, and even more clearly from the chart, the greatest number of establishments are operated by individuals, although corporations have increased from 23.6 per cent of

[67] Willard L. Thorp, *The Integration of Industrial Operation*, Census Monograph I. (Washington, D.C.: U.S. Department of Commerce, 1924.)

the total number in 1904 to 31.5 per cent in 1919. This growth in the proportion of corporations was quite regular throughout the period, and thus far has given no signs of diminution.

The most significant figures, however, are those which show the extent of the industrial activity of the corporations. Although including only 31.5 per cent of the establishments, they employed 86.6 per cent of the wage earners and manufactured 87.7 per cent of the total value of the products. The contrast in activity is brought out very

CORPORATE OWNERSHIP IN 12 RECENTLY DEVELOPED INDUSTRIES: 1919

Industry	Establishments: Total Number	Owned by Corporations: Number	Owned by Corporations: Per Cent of Total
All industries	290,105	91,517	31.5
Total for 12 industries	5,792	4,301	74.3
Aeroplanes	31	26	83.9
Automobiles	315	292	92.7
Sugar, beet	85	84	98.8
Cement	123	118	95.9
Electrical machinery, apparatus, and supplies	1,404	1,066	75.9
Ice, manufactured	2,867	1,911	66.7
Rubber goods	437	368	84.2
Oleomargarine and other butter substitutes	42	41	97.6
Phonographs	166	132	79.5
Aluminum manufactures	83	65	78.3
Coal-tar products	183	168	91.8
Pens, fountain and stylographic	56	30	53.6

clearly by the averages per establishment, in which the corporations far exceed the other forms. Whereas establishments operated by corporations employ an average of 86.1 wage earners per establishment, those operated by individuals average only 4.5 wage earners per establishment.

The corporate form of ownership is more prevalent among the newly formed enterprises. In the table shown above the character of ownership figures are given for 12 industries, which have been selected because they represent industrial activity whose development has been relatively recent. It is significant to note the character of ownership in these industries. The smallest proportion of corporate

ownership is more than two-thirds larger than the average for all industry, and in 10 of the 12 more than three-fourths of all establishments are corporation owned. These facts afford fairly positive evidence that enterprises which are now entering for the first time into industrial activity are prone to adopt the corporate form of organization.

In industries in which large capital investments are necessary for the proper operation of enterprises the establishments are, as a rule,

CORPORATE OWNERSHIP IN THE 13 INDUSTRIES LEADING IN TERMS OF LARGE-SCALE PRODUCTION: 1919

Industry	Rank: According to Wage Earners[1]	Rank: According to Value of Products[2]	Establishments: Total Number	Establishments: Operated by Corporations: Number	Establishments: Operated by Corporations: Per Cent of Total
Sugar refining	1	1	20	17	85.0
Boots and shoes, rubber	2	5	25	24	96.0
Smelting and refining, copper	8	2	34	34	100.0
Iron and steel, steel works and rolling mills	5	10	500	481	96.2
Shipbuilding, steel	3	13	162	148	91.4
Belting and hose, rubber	9	7	15	15	100.0
Smelting and refining, lead	12	3	25	24	96.0
Locomotives	6	11	17	16	94.1
Smelting and refining, zinc	13	6	39	39	100.0
Cars, electric-railroad	7	14	7	6	85.7
Iron and steel, blast furnaces	16	9	195	187	95.9
Ordnance and accessories	10	15	26	25	96.2
Cars, steam-railroad	11	16	99	98	99.0

[1] According to proportion of establishments employing over 250 wage earners.
[2] According to proportion of establishments producing over $1,000,000 products.

operated by corporations, since it is easier under this form of ownership to obtain the required capital. This generalization has as its logical corollary that the larger the establishments in an industry the more apt are they to operate under the corporate form of ownership. Data on this point are given in the table shown above. The 13 industries operating on the largest scale are here listed, ranked according to their concentration in terms of wage earners and of value of products, with the percentages of establishments which are corporate owned. Only two industries fall below the 90 per cent mark.

At the other end of the scale are certain industries into which the corporate form of organization has not entered to such a degree. In

general, these are the smaller and less significant industries. In 1900 there were 19 industries in which less than 70 per cent of the product was made in establishments owned by corporations. By 1914 this number had decreased to 10, and in 1919 to 9. The industries which recorded low percentages made by corporations in 1919 were:

Industry	Per Cent	Industry	Per Cent
Clothing, women's	32.9	Jewelry	55.4
Millinery and lace goods	46.9	Clothing, men's, including shirts.	55.5
Turpentine and rosin	47.0	Butter, cheese, and condensed milk	65.8
Bread and other bakery products	51.8	Leather goods	67.1
Marble and stone work	52.6		

Of the major industries these nine are therefore those in which the development of corporate ownership has shown the least progress. They are all industries in which the average size of establishment is small. They average 12.3 wage earners per establishment, as compared with the general average of 31.4 for all industry. If the two clothing industries, in which the lack of corporate ownership is to a considerable degree the result of the sporadic nature of many shops and of the unusual extent of family holdings, be excluded, the average number of wage earners drops to 8.2 per establishment. In other words, just as it was shown that corporate ownership appeared particularly in industries in which operations are on a large scale so it is evident that in the industries which operate on a small scale the extent of corporate ownership is less.

Although in any particular industry the corporation-owned establishments may be few, they usually carry on the major part of the activity of the industry. To illustrate this situation, the table on page 475 has been constructed. Although in the 22 industries in question the proportion of establishments operated by corporations ranged from 6.1 to 25.7 per cent, the proportion of wage earners ranged from 30.4 to 76.6 per cent and of value of products from 20.7 to 83.5 per cent.

Notwithstanding the tendency of partnerships to change to the corporate form of organization, the partnership or firm is still important, particularly in certain industries peculiar to cities, such as those manufacturing clothing, and the allied industries such as those producing artificial flowers, feathers and plumes, buttons, fur goods,

men's furnishing goods, fur-felt hats, and millinery and lace goods. Of the concerns which reported themselves as being on a cooperative basis practically all belonged either to the butter, cheese, and condensed milk industries, or the printing and publishing industry. In

Activity of Corporations in 22 Industries Having Fewest Establishments Owned by Corporations: 1919

Industry	Establishments			Wage Earners (Average Number)			Value of Products (Thousands of Dollars)		
	Total	Operated by Corporations		Total	In Establishments Owned by Corporations		Total	In Establishments Owned by Corporations	
		Number	Per Cent of Total		Number	Per Cent of Total		Amounts	Per Cent of Total
Bread and other bakery products	25,095	1,748	7.0	141,592	76,008	53.7	1,151,896	596,560	51.8
Brooms	1,034	154	14.9	6,313	3,254	51.5	30,205	14,585	48.3
Carpets, rag	339	32	9.4	2,016	612	30.4	5,597	1,749	31.2
Carriages and wagons, including repairs	2,286	249	10.9	18,173	12,136	66.8	91,463	68,712	75.1
Cheese	3,530	505	14.3	3,997	1,288	32.2	143,456	29,676	20.7
Clothing, women's	7,711	1,641	21.3	165,649	62,144	37.5	1,208,543	398,061	32.9
Electroplating	515	94	18.3	3,024	1,134	37.5	10,390	4,587	44.1
Engraving and diesinking	478	29	6.1	1,878	1,025	54.6	7,351	4,216	57.4
Flour-mill and gristmill products	10,708	2,667	24.9	45,481	34,841	76.6	2,052,434	1,713,800	83.5
Fur goods	1,815	213	11.7	13,639	4,866	35.7	173,138	52,199	30.1
Liquors, vinous	342	40	11.7	1,011	709	70.1	17,454	12,236	70.1
Lumber and timber products	26,119	3,829	14.7	480,945	351,830	73.2	1,387,471	1,050,373	75.7
Marble and stone work	4,240	762	18.0	32,768	20,599	62.9	129,165	67,947	52.6
Millinery and lace goods	3,005	651	21.7	50,850	23,456	46.1	255,725	120,016	46.9
Printing and publishing, book and job	13,089	3,367	25.7	123,005	90,486	73.6	597,663	445,041	74.5
Saddlery and harness	1,823	253	13.9	10,411	7,434	71.4	83,713	61,653	73.6
Tobacco, cigars and cigarettes	9,926	796	8.0	138,773	96,849	69.8	773,662	639,487	82.7
Turpentine and rosin	1,191	247	20.7	28,067	11,552	41.2	53,051	24,946	47.0
Hats and caps, other than felt, straw, and wool	709	137	19.3	7,539	3,017	40.0	44,540	16,264	36.5
Iron and steel, tempering and welding	520	101	19.4	1,835	1,103	60.1	10,996	7,248	65.9
Models and patterns, not including paper patterns	928	145	15.6	6,949	3,160	45.5	25,300	12,034	47.6
Vinegar and cider	720	135	18.7	1,981	1,441	72.7	24,723	18,285	74.0

certain of the Northern Central States large proportions of the establishments in the dairy industry are operated by these cooperative societies. The cooperative printing and publishing concerns are controlled in most cases by societies, lodges, clubs, or labor unions.

See also:
"Medieval and Early Modern Business Associations," page 154.
"Forms of Combination and Agreement," page 893.
"The Corporation as an Instrument of Concentration," page 894.
"Other Instruments of Concentration," page 902.

CHAPTER IV

MODERN CAPITAL GOODS EXEMPLIFIED BY POWER AND THE MACHINE

Purposes of this chapter:

1. To see how man's material culture conditions production.
2. To inquire especially into the part played by capital goods, both active and passive.
3. To examine the contribution of the power-driven machine as a type of active capital goods.
4. To see some of the manifestations of modern technological methods in typical industries.
5. To sketch certain consequences of these modern technological methods.

The preceding chapter dealt with the fact that the economic order is but an aspect of our total culture and it emphasized especially the influence of our non-material culture upon production. In the present chapter we continue the discussion of the influence of our culture upon production, emphasizing the influence of our material culture—as represented, for example, by our buildings, tools, machines, power devices, and live stock. As was noted on page 336 this classification of culture as material and non-material culture is arbitrary and unreal, being justified only as it may facilitate discussion.

A still further bit of classification, drawing a distinction between consumers' goods and producers' goods, will give sharpness to our vision. Our present interest in the physical impedimenta of civliza-tion centers in the part they play in conditioning production. Now, some of these physical goods are in the hands of the ultimate consumer, and in a very real sense the food, shelter, clothing, furniture, carriages, etc., which are in the hands of the ultimate consumer do condition production. But, having recognized this fact, and having accepted the term "consumers' goods" (some persons prefer to call them "consumers' capital goods") as applicable to these goods, it is permissible to pass them by with little further thought on the ground that their

significance is self-evident. The rest of the physical equipment of civilization is in the hands of "producers," and the terms "inchoate wealth" (wealth not yet come to fruition) or "producers' goods" or "capital goods" are commonly applied to such goods. Their significance in the productive process is not so self-evident and they are accordingly given rather extensive treatment.

Still a further distinction. For many purposes it is helpful to differentiate between (*a*) those capital goods which are "passive" in the production process and (*b*) those which "act upon" these passive capital goods.

Typical classes of passive capital goods are goods-in-process (which are at their beginning stage *true* raw materials and are not infrequently called raw materials at every stage of processing); supplies (often called "indirect" material), such as fuel, lubricating oil, cratings, wrappings, etc.; certain types of live stock (which are a clear case of raw materials or goods-in-process when awaiting slaughter).

As compared with earlier cultures the modern economic order has at least three great advantages in this matter of passive capital goods. One advantage comes from the fact that modern science has greatly increased man's power to command materials. The science of chemistry has increased the availability of substitutes. Chemistry and other sciences have made nature more productive in yielding raw materials. A second advantage comes from the fact (noted in chap. ii) that any given group of men today can have at its command the raw materials of the whole world. Modern communication, transportation, and social organization have made this possible. The third advantage is that scientific standards and measurement have made possible a more effective utilization of the available stock of passive capital goods.

Typical classes of active capital goods are *plant,* including factory buildings, transportation roadbeds and tracks, telephone and telegraph lines, canals, bridges, etc.; *power devices,* including draft animals and the mechanical power devices connected with water power, steam power, gas power, electrical power, etc.; and *tools and machines.*

It has become a commonplace in our thinking that technology (the application of science to the arts of life) should be called upon

for aid in man's struggle with nature. In our present culture the range of these applications is very great, one classification[1] running thus: (1) conditioning processes, involving structural changes in materials, such as are readily exemplified by brickmaking and tanning; (2) extracting processes, involving the mechanical separation of some ingredient in a material, such as are readily exemplified by milling and sugar refining; (3) fabricating processes, involving the mechanical assembly of parts of materials into an organic whole, such as are exemplified by the making of shoes, clothing, furniture, paper, and pneumatic tires; (4) synthetic processes, involving the combination (usually chemical) of elements of materials in a homogeneous compound or mixture, such as are exemplified by canning, preserving, and cement-making; (5) analytic processes, involving chemical separation of materials into constituent elements or parts, such as are exemplified by oil refining and metallurgy; (6) manipulating processes, involving the mechanical change of the outward form of materials without structural transformation, such as are exemplified by lumbering and metal-working; and (7) electro-dynamic processes, involving the production, transmission, and conversion of electrical energy, such as are exemplified by power and light generation.

In such a vast field we must content ourselves with the study not of the whole territory but of some significant sample taken as a type case. The sample chosen lies in the mechanical field, the power-driven machine. Occasionally, by brief side excursions into other realms, we shall remind ourselves that this discussion of the technological applications of physics could be paralleled by similar discussions in the realms of other sciences and especially in chemistry and bacteriology; but in the main we must confine our study to this one type case.

A. The Power-Driven Machine

As we have seen, the tool chest of Neolithic man contained crude samples of substantially all the different *types* of tools which we use today. The outstanding difference in this respect between the two cultures is this: The tools of Neolithic man were made by rule of thumb; were of unsatisfactory materials; were set in the very simplest of machines (the hafted hatchet was a tool in a simple machine, the

[1] W. N. Mitchell, "The Place of Technology in the Business Curriculum," *Journal of Business of the University of Chicago*, Vol. I, No. 2 (April, 1928).

lever); and were seldom applied by any power other than man-power. Today our tools are made scientifically by the use of mathematical formulas and instruments of precision; are of vastly superior materials; have been multiplied in number and magnified in size and set in very complex mechanisms; and to these mechanisms have been applied vast mechanical powers through the use of the steam engine, the gas engine, the waterfall, and the electric motor. What this has meant in increased ability to cope with nature may be sensed from the fact that in the United States alone the mechanical power available must run well over one billion horse-power—equivalent to six billion mechanical slaves.

What has happened may be put this way. Man had no teeth that would serve him as well as those of the wolf and the tiger serve them. Very well. "He made for himself an artificial tooth. He took a stick and sharpened the end. He hardened this sharp point in the fire, or he inserted a piece of flint." Later, he hurled it by means of the bow. Much later, he put a "tooth" in the gun, and then no animal could compare with him. His arms were not strong. He "extended" his arms with tools, and then he multiplied his extended arms a thousand fold by setting the tools in machines and turning on the power.

So, also, man's legs were not as swift as those of the hare or the deer. His swimming was far poorer than that of the fish. Very well. He made for himself artificial legs and fins. These are seen today in the automobile, the locomotive, and the power boat. He had no wings, but today how powerful are his artificial wings! They carry him across the ocean or the continent. As for his messages, they move with the speed of light when he so wills.

The selections in this section should be read with the following issues[1a] in mind:

1. What does the tool contribute to production? Is it an aid in the control of nature's forces and powers? If so, in what respects?
2. What does the machine contribute to production? Is it an aid in the control of nature's forces and powers? If so, in what respects?
3. How can the *newness* of the power-driven machine be explained? What cultural steps had to be taken before it was possible?

[1a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 93–101. (University of Chicago Press.)

4. What are the highly significant dates or happenings in the development of man's control of mechanical powers?
5. What are some of the more significant measures of the increase of productivity brought about by the power-driven machine?
6. Does it seem likely that man is now at the crest of his abilities in his control of natural forces?

1. A GENERAL VIEW OF MODERN TECHNOLOGY[1b]

Studies designed to deal with technology in business might deal with the following:

I. The scientific background of technology. Consideration of the natural sciences which form the background or source of all technological activity and an explanation of their relation to manufacturing.

CHART I

Suggested Outline of the Subject Matter of the Technology of Production

I. The Scientific Background		II. Technological Processes and Means	III. Industrial Applications
Geography Geology Zoölogy Botany	Natural resources	1. *Basic raw materials* (For suggested classification see Chart II)	The application of technological processes and means in specific industries with special emphasis on resulting commodities. (For suggested classification of the industries see Chart V.)
Chemistry Physics Bacteriology	Scientific phenomena	2. *Basic technological processes* (For suggested classification see Chart III)	
Theoretical and applied mechanics		3. *Mechanical aids (tools)* (For suggested classification see Chart IV)	

II. Basic technological processes and means. Considered from three angles: (*a*) Raw materials or natural resources. (*b*) Basic processes, which are in reality the application of principles formulated by the chemist, physicist, and bacteriologist. (*c*) Tools, which are the mechanical means employed in applying the basic processes to the transformation of resources into usable goods.

III. Applications to specific industries with particular emphasis upon the resulting commodities of commerce. An attempt to classify industries both as to the thing acomplished, the commodity, and the method employed in accomplishing it. An explanation of how the

[1b] Adapted from W. N. Mitchell, "The Place of Technology in the Business Curriculum," *Journal of Business of the University of Chicago*, I, No. 2 (April, 1928), 230–36.

methods and means considered under II are utilized in the production of finished commodities.

This outline is elaborated in Chart I, in which the three main divisions just mentioned are shown in parallel columns. The first merely lists the natural sciences upon which technology is based.

CHART II

Classification of Basic Raw Materials Referred to in Chart I

Minerals	Metallic ores	Ferric	
		Non-ferric	Copper Zinc Lead Tin Aluminum Gold Silver
	Non-metallic materials		Stone Sand Clay Coal Mineral oils and tars
Agricultural	Animal		Hides and skins Fibers Meat Milk Oils and fats Misc. by-products
	Vegetal		Cereals Fibers Gums, oils, and juices Fruits Edible vegetables Medicinal plants and herbs
Nemoracultural			Lumber Pulp Misc. forest products
Fishing and trapping			Fish Skins and furs Oils
Non-material resources			Water power

The basic processes are considered from three essential angles. The first (II, a) dealing with natural resources as elaborated in Chart II, and representing applications of geography, botany, geology, and closely allied sciences, might possibly consist of an investigation of such matters as the relative importance and significance of leading resources, their natural origins, the influence of this natural distribu-

CHART III

Classification of Basic Technological Processes Referred to in Chart I

Chemical	Simple chemical interactions		Bleaching and dyeing (some) Precipitation (some) Saponification Corrosion Double decomposition (where not included in above)
	Physico-chemical interactions	Pyro-chemical	Combustion Baking Calcination Cooking Reduction Vitrification Metallic compounds
		Photo-chemical	
		Electro-chemical	Electrolysis
Physical	Thermo-physical interactions		Annealing Calendering Tempering Condensation Vaporization Fusion Solidification
	Electro-physical interactions		Electro-magnetic Electro-thermal
	Physico-molecular interactions		Absorption Infusion Crystallization Solution (sometimes chemical)
	Purely mechanical form changes		Abrasion Compression Cutting Extruding Forging Pulverizing Pulping Rolling
	Mechanical-manipulative processes		Aeration Assembly Coating Felting Imprinting Mixing Spinning Weaving Calibrating
	Mechanical-separative processes		Centrifugal Filtration Flotation Sifting
Bacteriological	Bacteria culture		Fermentation Putrefaction
	Bacteria destruction		Sterilization Refrigeration Antiseptic Desiccation

CHART IV

Classification of Mechanical Aids or Tools Referred To in Chart I

- **Power provision devices**
  - Power generation (prime movers and secondary apparatus)
    - Steam engines (and boilers)
    - Internal combustion engines
    - Hydraulic engines
    - Dynamos
    - Compressors and vacuum pumps
  - Power transmission and storage
    - Storage batteries
    - Electric transmission
      - Wiring
      - Transformers
      - Condensers
      - Motors
    - Belts and shafting
    - Pressure tanks and pipe lines
- **Temperature manipulation devices**
  - Heating devices
    - Blast furnaces
    - Open hearth furnaces
    - Reverberatory furnaces
    - Retorts and converters
    - Ovens and kilns
    - Cookers
    - Boilers
  - Cooling devices
    - Condensers
    - Atomizers
    - Radiators
    - Fans
- **Material fashioning devices**
  - Pressure shaping tools
    - Hammers
    - Presses
    - Rolling mills
    - Inflaters and deflaters
  - Molding tools
    - Molds, cores, etc.
  - Cutting tools
    - Shears
    - Saws
    - Planers and millers
    - Lathes
    - Drills and boring mills
    - Punch presses
  - Abrasive tools
    - Polishing and grinding wheels
    - Sanding belts
- **Material combination and separation devices**
  - Fabricating tools
    - Sewing machines
    - Riveting and welding machines
  - Fiber weaving tools
    - Looms
    - Spinning frames
    - Felting machines
    - Knitting machinery
  - Coating and printing tools
    - Dipping vats
    - Sprayers
    - Printing presses
  - Crushing and mixing tools
    - Crushers and grinding mills
    - Mixers
  - Separators and graders
    - Centrifugal separators
    - Bolting and sifting machines
    - Settling basins and filters
    - Stills
- **Material handling devices**
  - Transportation tools
    - Cranes and derricks
    - Trucks, cars, and trailers
    - Mechanical conveyors
    - Pumps and pipe lines
    - Blowers
  - Containers
    - Tanks
    - Vats
    - Bins, etc.

CHART V

Classification of Industries Referred To in Chart I

Processes	Industries	
Conditional processes—involving structural changes	Brick making	
	Tanning	
	Dairy products	
	Ice	
	Bleacheries	
	Pulp mills	
Extractive processes—involving the mechanical separation of some ingredient	Milling	
	Sugar	
	Syrups	
	Starch	
	Vegetable oils	
	Salt	
	Chemicals (some)	
Fabricative processes—involving the mechanical assembly of parts in an organic whole	Machine building	
	Textiles	Wool
		Cotton
		Silk
		Cordage
	Paper	
	Furniture	
	Precision instruments	
	Musical instruments	
	Shoe manufacture	
	Clothing manufacture	
	Tires, rubber goods	
Synthetic processes—involving the combination (usually chemical) of elements resulting in a homogeneous compound or mixture	Fertilizer	
	Soap	
	Cement	
	Bread and pastry	
	Confectionery	
	Alloys	
	Glass	
	Paint and varnish	
	Glue	
	Canning and preserving	
	Chemicals (some)	
	Explosives and pyrophoric materials	
Analytic processes—involving chemical separation into constituent elements or parts	Metallurgical	Iron
		Copper
		Lead
		Zinc
		Tin
	Coke and gas	
	Oil refining	
	Chemicals (some)	
	Drugs (some)	
Manipulative processes—involving the mechanical change of outward form without structural transformation	Lumbering	
	Stone working	
	Slaughtering and meat packing	
	Tobacco manufacturing	
	Printing	
	Photography and lithography	
	Lapidary	
	Paper goods—box	
Electro-dynamic processes—involving the production, transmission, and conversion of electrical energy	Metal working	Rolling mills
		Machine shops
		Foundries
		Forge shops
	Power and light generation	

tion upon the development of our transportation and marketing agencies, and in turn the influence of existing transportation agencies upon their utilization, existing property rights in these resources, their influence upon past and probably future trends of industrial development and localization, and kindred topics.

The second subsection (II, b) represents an attempt to classify and trace the scientific origin of basic technological processes, as indicated in Chart III. Many of these processes, it will immediately be noted, are common to widely different industries.

The third subsection (II, c) deals with a classification of tools of industry, as shown in Chart IV. In this part of the study the function and operating characteristics of typical mechanical devices, their general significance and the extent to which they supplement human labor, their limitations, and the new problems which their utilization has introduced for employer and employee might be presented.

Section III suggests the possibility of applying all three elements appearing in section II to specific industrial situations, with particular emphasis upon their influence with respect to properties and characteristics of commodities which form the subject matter of commerce. A possible classification of industries is presented in Chart V.

See also "Scientific Research and Natural Resources," page 323.

2. THE SIGNIFICANCE OF THE MACHINE TOOL[2]

With the coming of the Industrial Revolution, we find for the first time production being carried on by machinery in factories. Why had this not happened earlier? The capitalistic form of society had been in existence for over two hundred years; machines had been used, even if only in small numbers and in isolated instances; men had learned how to transfer skill and intelligence to their tools as soon as they learned to make tools; the printing press is a noble example of transfer of skill to the machine, and printing with movable type was over three hundred years old when the series of changes called the Industrial Revolution began; blast furnaces had been used before 1400. With so much by way of preparation, why did the Industrial Revolution wait until the latter half of the eighteenth century?

[2] By B. E. Goetz.

There is a good and sufficient reason why no invention prior to the textile inventions expanded rapidly enough to be referred to as a "revolution." Until that time machines just couldn't be made fast enough to revolutionize an industry. There were no machines to make machines and in many cases the cost of making machines by hand was prohibitive. The lathes of that day could not turn iron and steel. Flat surfaces could not be made. Forgings were laboriously pounded out by hand. In fine, it happened historically that *the textile machines were invented about the same time that methods of making them were developed*—about the same time that machine tools came into being. These made it possible for the textile inventions to sweep the country just as they made the steam engine possible.

The last three decades of the eighteenth century saw a vast development of machines (the so-called "machine tools") whose chief purpose was to make machines. Most machines are made of metal; therefore, a machine-building machine must be able to work metal. Wilkinson's boring bar was the first of such machines. It was built by a great mechanic to bore the cylinders of Watt's steam engine. It wasn't accurate according to modern standards but it was marvelously so according to the standards of the time. In thirty years' time a succession of great mechanics had invented almost the whole list of machine tools that we use today, and had put most of them in essentially their modern form. These great mechanics all knew each other; indeed, most of them got their start in machine-building by working for a few of the early men in the field.

It sometimes puzzles people where the vast increase in fixed capital during the Industrial Revolution came from. It came in large part from these men who were ironsmiths with considerable contact with the physical sciences of the day. They designed and built their own machines, their own fixed capital; they built machines to expand their plants so they could build more machines more rapidly. They built machines to do all sorts of work and sold them to other industries. With the money acquired in this way they hired assistants. The assistants were trained in building machines and in designing new machines and eventually left to set up shops of their own, either buying their initial machines from their masters or building their own. This expansion of fixed capital was no slow process of gradual accumula-

tion. It was a very rapid process of capital being built right from the raw materials.

Great quantities of machinery could not come into existence without machine-building machines. The modern factory system requires huge amounts of machinery. The steam engine, any machines requiring considerable accuracy at low cost, could not come into existence until there were machines to build them. Consequently there is much justice in saying that the Industrial Revolution began with the inventions of the first machine tools.

The machine tools are the only class of reproducing machines. A power loom can weave cloth but it cannot give birth to new power looms. The power loom in combination with any other machines would not aid in building new power looms. It is also true that a single machine tool, the lathe, for example, cannot reproduce itself, but the lathe with the aid of other machines in the machine tool group can build new lathes. The machine tool group as a whole does reproduce. Among the members of the group any of them can be constructed.

In addition to this peculiar power of reproducing themselves, the machine tools are used in building all other kinds of machinery. Engineering practice restricts the term "machine tools" to the machines used in a machine shop. These are metal-cutting machines and the list runs thus:

The lathe, used for turning cylinders, cones, screws, etc.
The planer, and the shaper, used for making flat surfaces.
The gear cutting machine.
The milling machine, used for nearly any kind of metalcutting work—sometimes more expensive and no better than the above-mentioned machines.
The grinding machine will do much the same work as the milling machine but much more accurately and more expensively.
The boring mill, the slotting machine, the drill press, and others are modifications of the above machine.

To arrive at the full significance of all these machine tools we shall do well also to include other metal working machines such as the power-hammers, rolling-mills, punch presses, and today, perhaps, the molding machines used in the metal foundry.

Any industry using machines is directly dependent upon the machine tool for its physical equipment. Practically all industries today use machinery. Most of them use great quantities of it. Even those

that do not are dependent on machine-tool-built methods of transportation, on sources of raw materials, on markets that are so dependent on the machine tool.

Most large plants have extensive repair departments. Here again the machine tool is supreme. In making new parts, in repairing old, in refitting worn parts, the metal-working machine is a necessity.

3. THE SERVICES OF THE NEW TECHNOLOGY

A. THE GAINS OF ROUNDABOUT PRODUCTION[3]

I am short-sighted, and wish to have a pair of spectacles. For this I require ground and polished glasses and a steel framework. But all that nature offers towards that end is silicious earth and iron ore. How am I to transform these into spectacles? Work as I may, it is as impossible for me to make spectacles directly out of silicious earth as it would be to make the steel framework out of iron ore. Here there is no immediate or direct method of production. There is nothing for it but to take the roundabout way, and, indeed, a very roundabout way. I must take silicious earth and fuel, and build furnaces for smelting the glasses from the silicious earth; the glass thus obtained has to be carefully purified, worked, and cooled by a series of processes; finally, the glass thus prepared—again by means of ingenious instruments carefully constructed beforehand—is ground and polished into the lens fit for short-sighted eyes. Similarly I must smelt iron in the blast furnace, change the raw iron into steel, and make the frame therefrom—processes which cannot be carried through without a long series of tools and buildings that, on their part again, require great amounts of previous labour. Thus, by an exceedingly roundabout way the end is attained.

In the last resort all our productive efforts amount to shiftings and combinations of matter. We must know how to bring together the right forms of matter at the right moment, in order that from those associated forces the desired result, the product wanted, may follow. But, as we saw, the natural forms of matter are often so infinitely large, often so infinitely fine that human hands are too weak or too coarse to control them. We are as powerless to overcome the cohesion

[3] Adapted by permission from Eugene von Böhm-Bawerk, *The Positive Theory of Capital*, pp. 18–22. (Macmillan and Co., Ltd., 1891.)

of the wall of rock when we want building stone as we are, from carbon, nitrogen, hydrogen, oxygen, phosphor, potash, etc., to put together a single grain of wheat. But there are other powers which can easily do what is denied to us, and these are the powers of nature. There are natural powers which far exceed the possibilities of human power in greatness, and there are other powers in the microscopic world which can make combinations that put our clumsy fingers to shame. If we can succeed in making those forces our allies, in the work of production, the limits of human possibility will be infinitely extended. And this we have done.

Often, of course, we are not able directly to master the form of matter on which the friendly power depends, but in the same way as we would like it to help us, do we help ourselves to gain it; we try to secure the alliance of a second natural power which brings the form of matter that bears the first power under our control. Just as we control and guide the immediate matter of which the good is composed by one friendly power, and that power by a second, so can we control and guide the second by a third, the third by a fourth, this again by a fifth, and so on—always going back to more remote causes of the final result—till in the series we come at last to one cause which we can control conveniently by our natural powers. This is the true importance which attaches to our entering on roundabout ways of production, and this is the reason of the result associated with them; every roundabout way means the enlisting in our service of a power which is stronger or more cunning than the human hand; every extension of the roundabout way means an addition to the powers which enter into the service of man, and the shifting of some portion of the burden of production from the scarce and costly labour of human beings to the prodigal powers of nature.

And now we may put into words an idea which has long waited for expression, and must certainly have occurred to the reader; the kind of production which works in these wise circuitous methods is nothing else than what economists call Capitalist Production, as opposed to that production which goes directly at its object, as the Germans say, "mit der nackten Faust." And Capital is nothing but the complex of intermediate products which appear on the several stages of the roundabout journey.

See also:
"A Sketch of the Development of Science," page 348.
"Four Stages in the Development of the Use of Knowledge," page 354.
"The Engineering Profession," page 356.

B. WHAT THE MACHINE IS[4]

All fully developed machinery consists of three essentially different parts, the motor mechanism, the transmitting mechanism, and finally the tool or working machine. The motor mechanism is that which puts the whole in motion. It either generates its own motive power, like the steam engine, the caloric engine, the electro-magnetic machine, etc., or it receives its impulse from some already existing natural force, like the water-wheel from a head of water, the windmill from wind, etc. The transmitting mechanism, composed of fly-wheels, and shafting, toothed wheels, pullies, straps, ropes, bands, pinions, and gearing of the most varied kinds, regulates the motion, changes its form where necessary, as for instance from linear to circular, and divides and distributes it among the working machines. These two first parts of the whole mechanism are there solely for putting the working machines in motion, by means of which motion the subject of labour is seized upon and modified as desired. The tool or working-machine is that part of the machinery with which the industrial revolution of the eighteenth century started. And to this day it constantly serves as such a starting-point, whenever a handicraft, or a manufacture, is turned into an industry carried on by machinery.

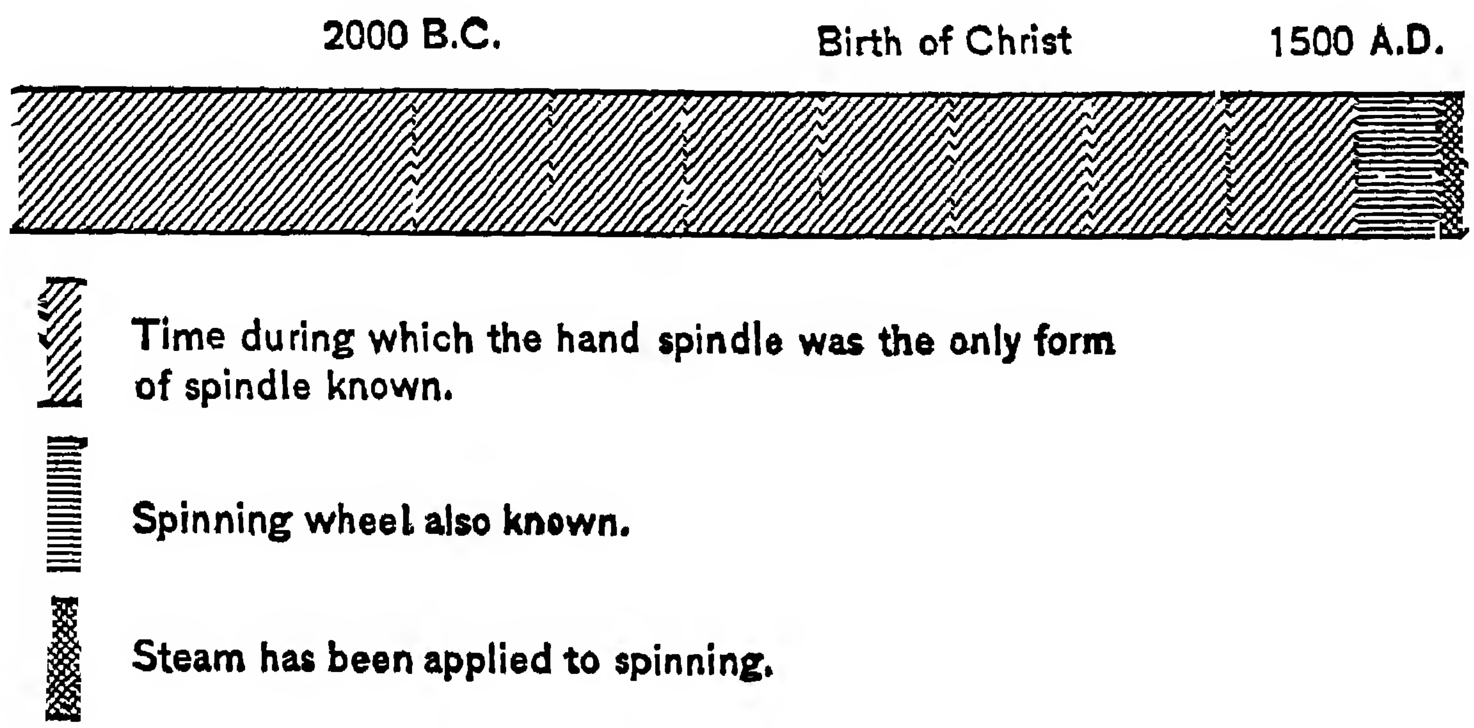
On a closer examination of the working-machine proper, we find in it, as a general rule, though often, no doubt, under very altered forms, the apparatus and tools used by the handicraftsman or manufacturing workman; with this difference, that instead of being human implements, they are the implements of mechanism, or mechanical implements.

An organized system of machines, to which the motion is communicated by the transmitting mechanism from a central automaton, is the most developed form of production by machinery. Here we have,

[4] Adapted by permission from Karl Marx, *Capital*, I, 405–18. (Charles H. Kerr & Co., 1909.)

in the place of the isolated machine, a mechanical monster whose body fills whole factories, and whose demon power, at first veiled under the slow and measured motions of his giant limbs, at length breaks out into the fast and furious whirl of his countless working organs.

Just as the individual machine retains a dwarfish character, so long as it is worked by the power of man alone and just as no system of machinery could be properly developed before the steam engine took the place of the earlier motive powers, animals, wind, and even water; so, too, Modern Industry was crippled in its complete develop-



THE BRIEF REIGN OF THE MACHINE

ment so long as its characteristic instrument of production, the machine, owed its existence to personal strength and personal skill, and depended on the muscular development, the keenness of sight, and the cunning of hand with which the detail workmen in manufactures, and the manual labourers in handicrafts, wielded their dwarfish implements.

See also "The Hazardous Nature of Modern Industry," page 604.

C. FUNCTIONS AND STRIKING OPPORTUNITIES OF MACHINERY[5]

Man does his work by moving matter. Hence machinery can only aid him by increasing the motive power at his disposal.

1. Machinery enables forces of man or nature to be more effec-

[5] Taken by permission from J. A. Hobson, *The Evolution of Modern Capitalism*, pp. 72–74; 90–92. (The Walter Scott Publishing Co., Ltd., 1912.)

tively applied by various mechanical contrivances composed of levers, pulleys, wedges, screws, etc.

2. Machinery enables man to obtain the use of various motor forces outside his body—wind, water, steam, electricity, chemical action, etc.

Thus by the provision of new productive forces, and by the more economical application of all productive forces, machinery improves the industrial arts.

Machinery can increase the scope of man's productive ability in two ways. The difficulty of concentrating a large mass of human force upon a given point at the same time provides certain quantitative limits to the productive efficiency of the human body. The steam-hammer can perform certain work which is quantitatively outside the limit of the physical power of any number of men working with simple tools and drawing their motor power from their own bodies. The other limit to the productive power of man arises from the imperfect continuity of human effort and the imperfect command of its direction. The difficulty of maintaining a small, even, accurate pressure, or a precise repetition of the same movement, is rather a qualitative than a purely quantitative limit. The superior certainty and regularity of machinery enables certain work to be done which man alone could not do or could do less perfectly. The work of the printing machine could not be achieved by man. Machinery has improved the texture and quality of certain woolen goods; recent improvements in milling result in improved quality of flour, and so on. Machinery can also do work which is too fine or delicate for human fingers, or which would require abnormal skill if executed by hand. Economy of time, which Babbage accounts a separate economy, is rightly included in the economies just named. The greater rapidity with which certain manufacturing processes—e.g., dyeing—can be achieved arises from the superior concentration and continuity of force possible under machinery. All advantages arising from rapid transport are assignable to the same causes.

The continuity and regularity of machine work are also reflected in certain economies of measurement. The faculty of self-registering, which belongs potentially to all machinery, and which is more utilised every day, performs several services which may be summed up by saying that they enable us to know exactly what is going on. When to

self-registration is applied the faculty of self-regulation, within certain limits a new economy of force and knowledge is added. But machinery can also register and regulate the expenditure of human power. Babbage well says: "One of the most singular advantages we derive from machinery is in the check which it affords against the inattention, the idleness, or the knavery of human agents." This control of the machine over man has certain results which belong to another aspect of machine economy.

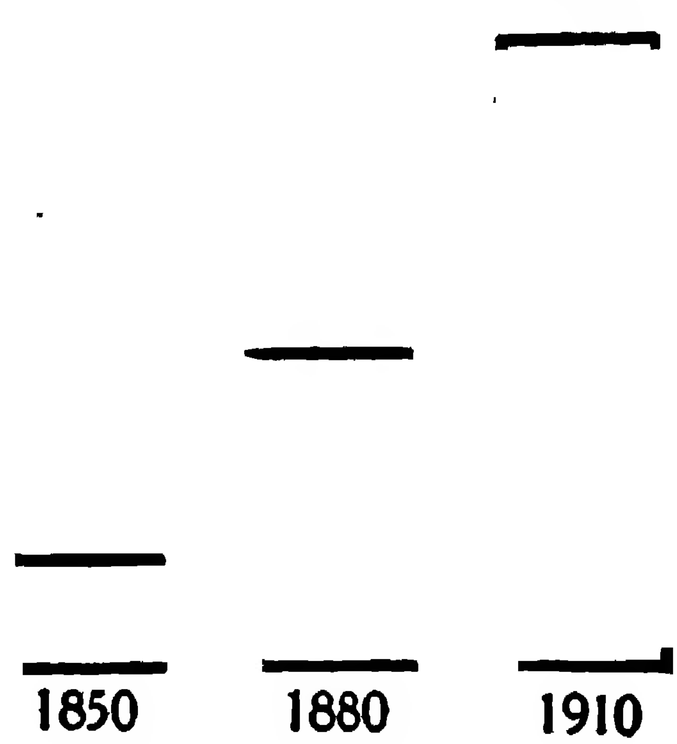
See also:
"The Transfer of Thought, Skill, and Intelligence," page 555.
"Standardization and the Machine Process," page 557.

4. THE INCREASE OF ACTIVE CAPITAL IN THE UNITED STATES

A. GENERAL STATEMENT[6]

In Table I we have an attempt to collect the various figures of the United States Census and combine them into a harmonious whole. While the numbers are, in no case, exact, it is believed that the errors are too small to vitiate any of the following conclusions. We see that the total supply of active capital has enormously increased; in fact, that in 1910 the value was about seventeen times as great as in 1850. In this great increase, all industries have participated, but the fishing equipment has grown most slowly and the transportation facilities fastest of all. At no census year has there been a recession in a single industry—development has been continuous in all lines.

But an increase in the total value of active capital is not, in itself, significant. It must be compared with



Sixty Years of Increase of Capital Goods

There was in the United States in 1910 five times as much per capita of capital goods in fisheries, in live stock, machinery, tools, implements, railroads, business buildings, and improvements as there was in 1850. Noticethat this is true per capita.

[6] Adapted by permission from W. I. King, *The Wealth and Income of the People of the United States*, pp. 42–44. (The Macmillan Co., 1915.)

the increase in population and with a changing price-level before we can arrive at any conclusions concerning the influence of the change upon the social welfare. The third column in Table II indicates that

TABLE I

THE ESTIMATED VALUE OF THE SUPPLY OF ACTIVE CAPITAL IN THE CONTINENTAL UNITED STATES, IN MILLIONS OF DOLLARS

Census Year	Total	Business Buildings and Fixed Improvements	Railroads and Other Public Utilities	Movable Machinery, Tools, and Implements	Livestock	Fisheries
1850...........	2,757	1,113	639	399	599	7
1860...........	5,900	2,160	1,868	665	1,198	9
1870...........	8,978	2,975	3,109	1,206	1,678	10
1880...........	13,636	4,117	5,386	2,373	1,735	25
1890...........	19,298	5,700	8,366	2,665	2,538	29
1900...........	24,783	7,250	10,926	4,006	3,197	34
1910...........	47,961	13,301	23,319	5,995	5,296	50

the per capita value of active capital has steadily grown larger until, in 1910, it has become more than four times as great as in 1860. Only in the Civil War period has this apparent increase been due wholly to

TABLE II

QUANTITY OF ACTIVE CAPITAL IN THE UNITED STATES (Outlying possessions excluded)

Census Year	Total Value of the Active Capital Supply in Millions of Dollars	Per Capita Value of Active Capital	Price Index	Index of Quantity of Capital per Capita
1850................	2,757	$119	139.2	85
1860................	5,900	188	141.3	133
1870................	8,978	233	221.6	105
1880................	13,636	272	132.4	205
1890................	19,298	307	113.6	270
1900................	24,783	326	101.7	321
1910................	47,961	521	126.5	412

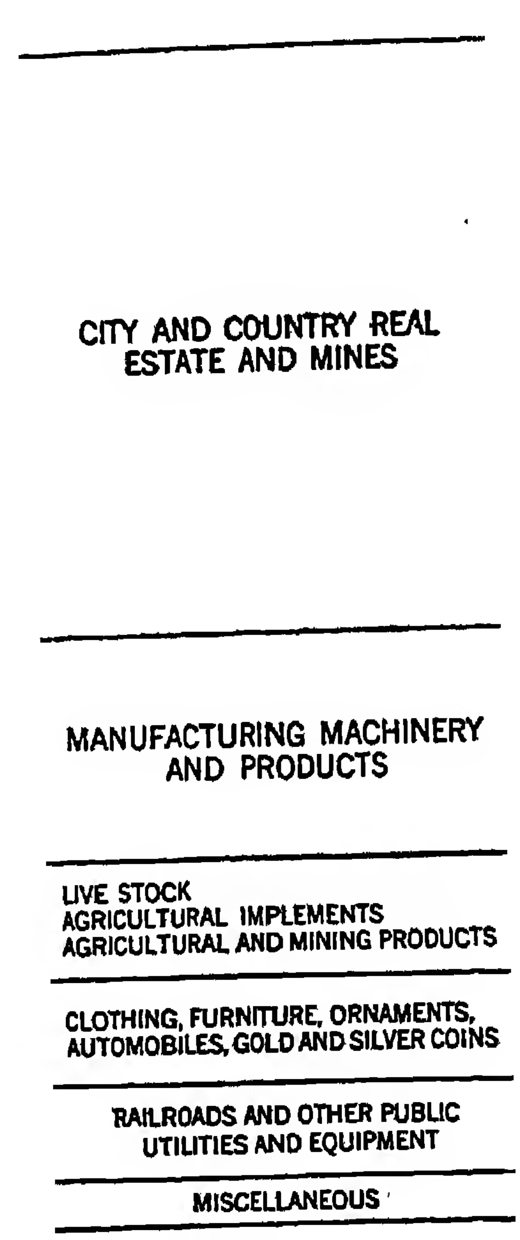
changing prices, for, if the per capita value is divided by the price index, we obtain an index of amount which climbs upward until the quantity per capita existing in 1850 is more than quadrupled. The only backward step shown is in the decade 1860 to 1870, and this was due, probably, to the wholesale destruction of capital by the Civil War, a blow from which the Southern States had only begun to recover in

1870. The more or less chaotic conditions of the South in 1870 may also have resulted in some incompleteness in the Census returns.

See also "Power Developments in the United States," page 502.

B. ACTIVE CAPITAL IN MANUFACTURING[1]

The census of manufactures has periodically included a question on the amount of capital invested in the various manufacturing enterprises and has tabulated the returns. This, however, includes in addition to fixed capital in the form of machinery and buildings, working capital including raw materials, goods in process of manufacture and finished goods in warehouses. It also includes land. We shall attempt to measure the changes in the physical quantity of (1) machinery, tools, and equipment and (2) factory buildings. The table gives an index of growth, taking the year 1899 as a base.



LEADING FORMS OF WEALTH IN THE UNITED STATES

It may be remarked that this index shows a truly unprecedented growth in the volume of fixed capital. Thus the amount virtually doubled during the decade from 1900 to 1909. This was a compounded average yearly rate of increase of 7 per cent. This same rate of increase was virtually maintained during the succeeding decade. From 1919 on the rate of growth slackened during the three succeeding years but while we have not computed the growth since 1922 it has beyond question increased greatly since then. Taken as a whole this period showed an approximate doubling in the quantity during every decade, which would probably be scaled down to about 6 per cent per year compounded if deductions were made

[1] Adapted by permission from Charles W. Cobb and Paul H. Douglas, "A Theory of Production," in the March, 1928, supplement of the *American Economic Review*.

for the increased cost of replacing the old capital. This is a rate of growth which it is believed has not been matched by any other country. It will be remembered that Cassel estimates the rate of growth of capital in Western Europe at 3 per cent a year. If this is true, the rate

Estimated Annual Additions to Fixed Capital in Manufacturing, Together With Cumulative Total Capital as Expressed in Terms of Cost and 1880 Prices (Millions of dollars), 1899–1922

Year	Annual Increase in Terms of 1880 Dollars	Total Fixed Capital in 1880 Dollars	Relative Total Capital 1889 = 100
1899	387	4,449	100
1900	297	4,746	107
1901	315	5,061	114
1902	383	5,444	122
1903	362	5,806	131
1904	326	6,132	138
1905	494	6,626	149
1906	611	7,237	163
1907	595	7,832	176
1908	397	8,229	185
1909	591	8,820	198
1910	420	9,240	208
1911	384	9,624	216
1912	443	10,067	226
1913	453	10,520	236
1914	353	10,873	244
1915	967	11,840	266
1916	1,402	13,242	298
1917	1,673	14,915	335
1918	1,350	16,265	366
1919	969	17,234	387
1920	884	18,118	407
1921	424	18,542	417
1922	650	19,192	431

of industrial capital growth in the United States has been twice as great while if the growth be reckoned on a per capita basis, the disparity is even greater.

See also:
"Estimated National Wealth of the United States," page 277.
"A Classification of Production Elements," page 283.
"An Index of Energy Consumption," page 500.
"Power Developments in the United States," page 502.

5. THE PRODUCTIVITY OF MACHINERY

A. IN AGRICULTURE[8]

The number of days' work of man-labor requisite for producing the specified crops by the aid of machine power, together with the quantity of those several crops which the same labor-power could have produced by the earlier hand method, is shown in the following:

Name	Crop Of	Quantity Produced	Days' Work of Man-Labor Required	The Same Labor-Power	
				By Methods of	Could Have Produced
Barley....	1896	69,695,223 bu.	630,354	1829–30	2,972,839 bu.
Corn......	1894	1,212,770,052 bu.	45,873,027	1855	473,528,022 bu.
Cotton....	1895	7,161,094 500-lb.bales	28,178,904	1841	2,518,972 bales
Hay......	1895	47,078,541 tons	18,556,791	1850	8,801,640 tons
Oats......	1893	638,854,850 bu.	11,334,266	1830	68,433,307 bu.
Potatoes...	1895	297,237,370 bu.	5,134,100	1866	103,703.321 bu.
Rice......	1895	168,685,440 lbs.	108,889	1870	46,303,587 lbs.
Rye......	1895	27,210,070 bu.	2,739,147	1847–48	10,872,795 bu.
Wheat....	1896	427,684,346 bu.	7,099,560	1829–30	23,245,490 bu.

Finding next the difference between the quantities of the several crops actually produced under machine methods in the years indicated, and the quantities which the labor-power requisite for their production with the aid of machines could have produced had it been devoted to the production of those same crops by hand methods, we have the following:

Name	Crop Of	Due to Use of Machinery	Percentage of Actual Product
Barley...........	1896	66,722,384 bu.	95.7
Corn.............	1894	739,242,030 bu.	60.9
Cotton...........	1895	4,642,122 bales	64.8
Hay............	1895	38,276,901 tons	81.3
Oats.............	1893	570,421,543 bu.	89.2
Potatoes.........	1895	193,534,049 bu.	65.1
Rice............	1895	122,381,853 lbs.	72.5
Rye.............	1895	16,337,275 bu.	60.0
Wheat..........	1896	404,438,856 bu.	94.5

The increased effectiveness of man-labor power when aided by the use of machinery, as indicated by these figures, varies from 150 per

[8] Adapted by permission from H. W. Quaintance, "The Influence of Farm Machinery on Production and Labor," *Publications of the American Economic Association*, Third Series, Vol. V (1904), No. 4, pp. 21–23.

cent in the case of rye to 2,244 per cent in the case of barley. From this point of view, a machine is not a labor-saving but rather a product-making device. Taking the percentage of labor saved as indicating the average proportion of these crops due to the use of machinery, it appears that the quantity of product is almost five times as great per unit of labor as it formerly was.

It will be sufficient, for purposes of illustration, to consider only a few of the principal crops in the production of which machinery has become a recognized factor. The crops selected for this purpose, together with the time of man-labor requisite for producing stated quantities of each crop by hand and by machine methods, as reported by the Department of Labor, are shown in the following table:

Name and Quantity of Crop Produced and Description of Work Done	Year of Production		Time Worked			
			Hand		Machine	
	Hand	Machine	Hrs.	Min.	Hrs.	Min.
Barley: 30 bushels (1 acre) barley...	1829–30	1895–96	63	35.0	2	42.8
Corn: 40 bushels (1 acre) yellow corn, husked; stalks left in field.........	1855	1894	38	45.0	15	7.8
Cotton: By hand, 750 pounds; by machine 1000 pounds (1 acre) seed cotton..........................	1841	1895	167	48.0	78	42.0
Hay: Harvesting 1 ton (1 acre) timothy hay......................	1850	1895	21	5.0	3	56.5
Oats: 40 bushels (1 acre) oats.......	1830	1893	66	15.0	7	5.8
Potatoes: 220 bushels (1 acre) potatoes	1866	1895	108	55.0	38	......
Rice: 2640 pounds (1 acre) rough rice.	1870	1895	62	5.0	17	2.5
Rye: 25 bushels (1 acre) rye........	1847–48	1894–95	62	58.9	25	10.0
Wheat: 20 bushels (1 acre) wheat....	1829–30	1895–96	61	5.0	3	19.2

See also:

"The Recent Increased Efficiency of American Industry," page 926.

"Increase in Productivity Measured in Income Figures," page 934.

"Causes of Our Recent Increase in Productivity," page 943.

B. IN MANUFACTURES*

Name	Article Produced or Work Accomplished: Description, Hand	Description, Machine	Quantity	Year of Production: Hand	Year of Production: Machine	Different Operations Performed: Hand	Different Operations Performed: Machine	Different Workmen Employed: Hand	Different Workmen Employed: Machine	Time Worked, Hand: Hours	Time Worked, Hand: Minutes	Time Worked, Machine: Hours	Time Worked, Machine: Minutes	Labor Cost: Hand	Labor Cost: Machine
Boots.....	Men's cheap grade, kip, pegged boots, half-double soles	Men's cheap grade, kip, pegged boots, half-double soles	100 pairs	1859	1895	83	122	2	113	1,436	40.0	154	4.9	$408.5000	$35.4008
Shoes......	Men's fine grade, calf, welt, lace shoes, single soles, soft box toes	Men's fine grade, calf, welt, lace shoes, single soles, soft box toes	100 pairs	1865	1895	76	146	1	140	2,225	......	296	38.6	556.[illegible]496	74.3[illegible]
Shoes.....	Men's medium grade, calf, welt, lace shoes, single soles, soft box toes	Men's medium grade, calf, welt, lace shoes, single soles, soft box toes	100 pairs	1863	1895	73	173	1	371	1,831	40.0	234	36.3	457.9164	59.5461
Shoes......	Men's grain, pegged, brogan shoes, tap soles	Men's grain, pegged, brogan shoes, tap soles	100 pairs	1855	1895	45	84	1	98	283	20.0	62	4.6	56.6668	13.8246
Shoes......	Women's fine grade, kid, welt, button shoes, single soles, patent-leather tips, soft box toes	Women's fine grade, kid, welt, button shoes, single soles, patent-leather tips, soft box toes	100 pairs	1875	1896	102	140	1	140	1,996	40.0	173	29.5	499.1664	54.6535
Shoes......	Women's cheap grade, kid, turned, lace shoes, single soles, plain toes	Women's cheap grade, kid, turned, lace shoes, single soles, plain toes	100 pairs	1858	1895	67	95	1	85	1,025	20.0	80	22.3	256.3332	18.5882
Shoes......	Women's cheap grade, grain, pegged, button shoes, single soles, plain toes	Women's cheap grade, grain, McKay sewed, button shoes, half-double soles, plain toes	100 pairs	1868	1895	56	98	2	269	538	20.0	83	10.7	109.3331	20.4435
Cottonades.	36-inch twilled cottonade, 2.18 yards per pound, filling doubled and twisted, 40×40 picks	28-inch twilled cottonade, 3.15 yards per pound, filling doubled and twisted, 60×40 picks	500 yards	1893	1895	19	43	3	252	7,534	1.5	84	14.1	135.6127	6.8118
Drills......	36-inch cotton drills, 2.92 yards per pound, 36×44 picks	30-inch cotton drills, 3.08 yards per pound, 72×44 picks	500 yards	1893	1896	14	29	3	90	5,031	42.6	79	20.3	88.0549	3.8991
Ginghams..	36-inch gingham checks, 2.5 yards per pound, 44×40 picks	27-inch gingham check, 4.07 yards per pound, 48×40 picks	500 yards	1863	1895	18	43	3	152	5,844	43.3	72	42.0	102.2826	5.4477
Ginghams..	36-inch gingham plaids, 3.22 yards per pound, 40×36 picks	27-inch gingham plaids, 4.5 yards per pound, 52×44 picks	500 yards	1893	1895	15	45	3	283	5,038	36.6	63	53.1	50.3862	4.0286
Ginghams..	36-inch gingham stripes, 3.26 yards per pound, 36×32 picks	27-inch gingham stripes, 4.35 yards per pound, 44×52 picks	500 yards	1835	1895	16	40	3	166	5,130	12.5	119	14.2	174.4274	7.6882
Sheetings..	36-inch unbleached cotton sheeting, 3.18 yards per pound, 40×48 picks	36-inch unbleached cotton sheeting, 3 yards per pound, 48×48 picks	500 yards	1860	1897	14	53	3	282	5,605	......	52	45.6	84.0750	3.7217
Thread....	2-cord [illegible] thread, made from No. 6 yarn	No. 3 5-cord ball [illegible] cotton, made from No. 18 yarn	100 pounds	1870	1896	5	20	1	125	2,895	......	39	17.8	86.8500	1.8079
Yarn......	No. 12 cotton yarn	No. 12 cotton yarn	100 pounds	1896	1896	4	27	2	123	3,117	30.0	19	7.0	93.5250	1.2012

* From the *Thirteenth Annual Report of the Commissioner of Labor* (1898), I, 28–29, 40–41.

6. AN INDEX OF ENERGY CONSUMPTION[9]

The present index includes the raw energy consumed for all purposes, heat and light as well as mechanical power.

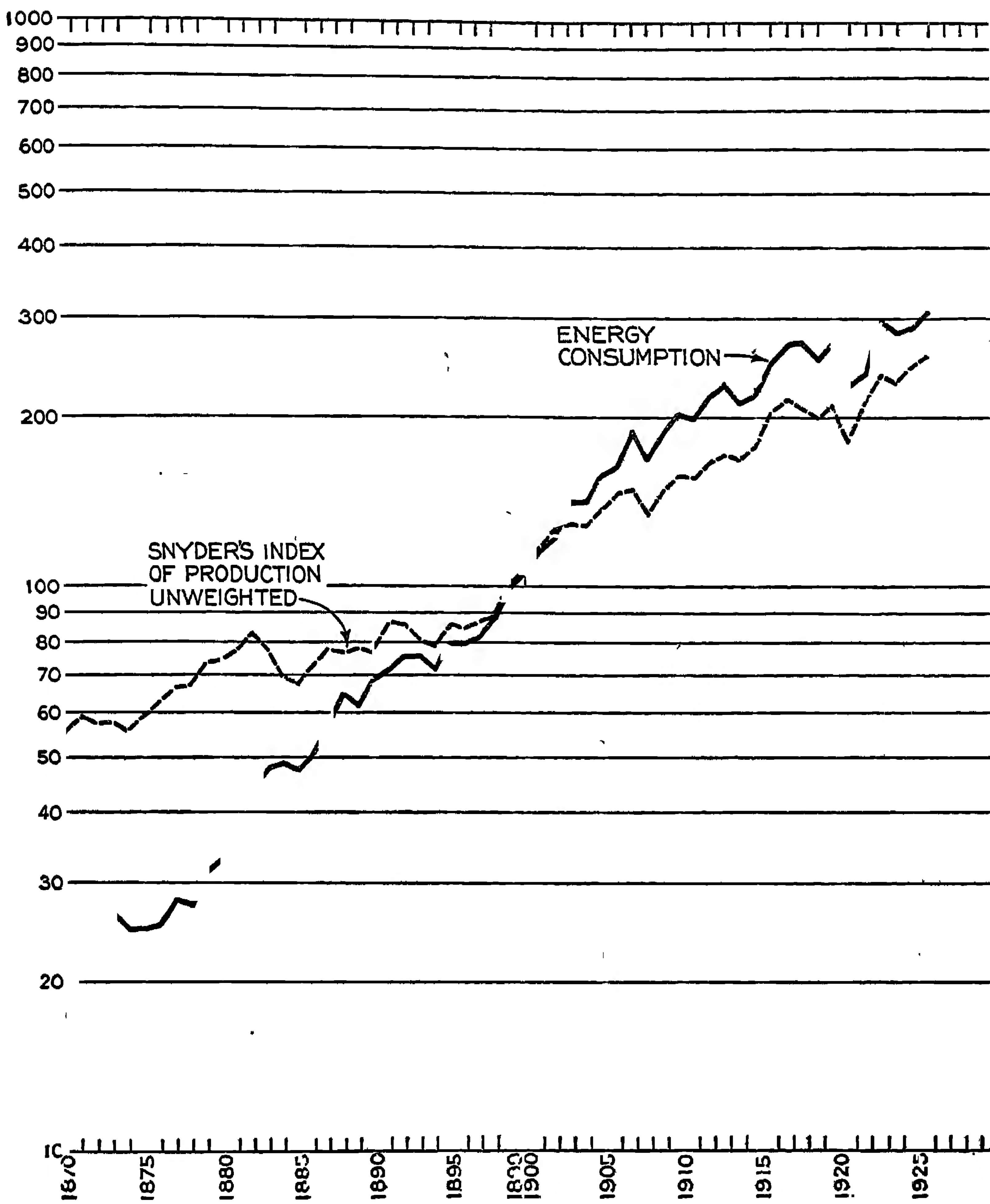
The heavy black line in the chart is an index of the quantity of energy materials consumed in the United States in each year from 1870 to 1926. The base is the year 1899. The index includes the mineral fuels consumed, and the coal equivalent of the power developed by water wheels, by work animals, and by windmills. It includes the charcoal used in blast furnaces, but not other forms of wood fuel. All of these fuels or fuel equivalents have been reduced to a common denominator in British thermal units.

In the chart the index, uncorrected for annual growth, is plotted on logarithmic scale alongside an unweighted index of production worked out by Dr. Carl Snyder. Snyder's is the only general index of the physical volume of production which has been carried back to 1870. It includes a varying number of items, beginning with 49 in 1870 and increasing to 86 in 1910. The items are unweighted. As originally presented by Mr. Snyder before the American Economic Association in 1920, the index was computed on a base of 1910–14 equals 100, which is here recomputed to base 1899 equals 100. The parallelism of the fluctuations in the two curves is fairly clear, even in the period before 1890, and this is the more remarkable because Snyder's index includes a number of agricultural products, which constitute a relatively large part of the forty-nine items used in the beginning of his series. I might add that when the energy index is plotted against Stewart's weighted index of the volume of manufactures for the period 1890 to 1899 and against Day's weighted indexes of manufactures and mining, as published in the *Harvard Review of Economic Statistics,* it shows the same harmony.

It will be seen that the rate of growth of the energy index is faster than that of the production index, and of course much faster than the growth of population. Whereas the physical volume of production has been found to increase at the rate of something like 4 per cent a year, the consumption of energy over much of the period shown was compounding at the rate of from 5 to 7 per cent a year.

[9] Adapted from F. G. Tryon, "An Index of Consumption of Fuels and Water Power," *Journal of the American Statistical Association,* September, 1927, pp. 274–79.

It is interesting to compare the growth of energy consumption with the growth of other measures of economic activity. Let us take



UNADJUSTED INDEX OF ENERGY CONSUMPTION COMPARED WITH SNYDER'S UNWEIGHTED INDEX OF PRODUCTION, 1870–1926. BASE, 1899 = 100.0

the period from 1899 to 1916, a period when fuel economy was progressing at a moderate but relatively constant rate. In that period the index of energy shows an increase of 150 per cent.

In the same period:

Population	Increased	36	per cent
Physical volume of agricultural production (Average 1914–18, Stewart)	"	32	" "
Physical volume of manufactures (Stewart)	"	130	" "
Physical volume of mining (Stewart)	"	156	" "
Railroad transportation (Stewart)	"	179	" "
Stewart's combined index of all production (agriculture, manufactures, mining, and transportation)	"	80	" "

The increase in energy consumption was thus four times as great as the increase in population, and nearly twice as great as the increase in the total volume of production. It was materially greater than the increase in manufactures. It was somewhat less than the increase in mining, but it must be remembered that the largest elements in mining are the energy materials coal and oil, while the energy index itself is held down by the inclusion of the vanishing horse. Finally the increase in energy was somewhat less than that in transportation.

The broad relationships are unmistakable. A great increase in per capita production is made possible by a still greater increase in power, and along with the process goes an increase in transportation which is the greatest of all consumers of power.

7. POWER DEVELOPMENTS IN THE UNITED STATES[10]

It is manifestly impossible, or at least impracticable, to make a census of our machines. They change and become obsolete too rapidly, and they can not be reduced to any satisfactory common unit. But there is one way whereby an *index* of the installation of machinery may be obtained—by ascertaining the total horsepower of the engines that drive the different kinds of machinery.

The technical side of a discussion on horsepower equipment may be divided into two parts—generation of power and transmission of power. The first deals with the making of kinetic energy out of the potential energy of natural resources such as coal, oil, and water. The second deals with devices that connect this energy of motion to machines which do man's work. The story of each of these phases falls

[10] Adapted from C. R. Daugherty, *The Development of Horsepower Equipment in the United States*, pp. 13–112. (Washington, D.C.: Department of the Interior, U.S. Government Printing Office, 1928.)

roughly into three periods—the colonial period, lasting till 1790; the period from 1790 to 1860; the period from 1860 to the present time.

I. During the colonial period the industrial situation in this country was similar to that existing in England before the industrial revolution. The manufacturer was a man who owned a small mill or operated a forge, and in colonial parlance a mill meant either a grinding contrivance or any machinery operated by hand, animal, wind, or water. These were the chief types of power in use at that time, and they came to be employed in the order named. Hand power was first used everywhere in forges and for grinding. The utilization of animal power came next, horses and cattle being used where absence of water power, pecuniary inability, or sparseness of population made it impracticable to use power of any other type. Wind was used to turn the wheels of gristmills and sawmills at an early date. Windmills were found chiefly among the Dutch settlers in New York, although there were a considerable number in New England. Indeed, the first mill to be operated in that section of the country was one propelled by wind near Watertown, Mass., in 1632. Most of the small colonial establishments, however, were operated by water power. Power transmission was so little understood that a separate wheel was generally necessary for each unit of machinery. The wheels and most of the mechanism were of wood. The invention of improvements by which several kinds of apparatus—threshing and winnowing machines, grist and bolting mills, flax beating and cleaning machinery—could be operated by a single wheel is attributed to a Connecticut mechanic [Joel Harvey], who not long before the Revolution received a prize from the London Society of Arts for his devices. Any part of the machinery could be discontinued without impeding the rest.

The steam engine was of no importance as a prime mover in colonial manufactures. It had only just been proved practicable and was yet in the experimental stage. Watt's engine was patented in 1769, but it did not become a really established factor in the economic life of Great Britain until the colonies had won their freedom.

II. In the second period, however, up to the Civil War, the factory system of manufacture began to develop, and a number of improvements were effected. At first the very fact that water power was so plentiful and inexpensive led to wastefulness in its use. Managers

of enterprises chose to employ cheap water wheels rather than invest in more expensive ones which by their more economical utilization of water would have amply justified the extra cost. Until 1840, for example, wooden pitchback wheels were used which turned inward toward the fall, the water striking them just short of their highest point, the impact or kinetic energy of the falling water being thus lost.

It is believed that the introduction of the first steam-engine mill at Providence, R.I., in 1830 stimulated the search for a more efficient way to utilize water power. Interest turned to the hydraulic turbine. This prime mover had reached its greatest perfection in France. It had been tried in this country in 1790, but the experiment was a failure. Soon after 1840 the Franklin Institute of Philadelphia published accounts of the French wheels which led to experimentation and resulting proof of their greater efficiency and cheapness. There is some difference of opinion as to when the hydraulic turbine was first used in this country, but it is safe to say that by 1845 there were two or three in successful operation. The introduction of the turbine was the first step toward the modern hydraulic plant.

Steam engines, to the introduction of which was partly due the marked improvement in the economical utilization of water power, were installed slowly at first. During the first third of the nineteenth century the location of factories was determined chiefly with reference to water power. But improvements in the steam engine led to their increasing use during the later half of this period.

Two general designs of engine came into early use—the low-pressure Boulton and Watt type, imported from England and also built in America, and the high-pressure type, made by Oliver Evans in Philadelphia, which was able to compete actively with the low-pressure engine and which was in some respects superior. The high-pressure engine was more satisfactory for use in factories, and, although it required more fuel, was simpler to build.

The invention of the crank shaft by Watt in 1784 changed the reciprocating motion of the engine piston to the rotary motion of a shaft, and the use of all the expanding power of steam in triple-expansion engines is another outstanding improvement in this period. But perhaps the greatest advance, so far as factory use is concerned, was that made in the new Corliss engine of 1849. This engine possessed a

much more sensitive governor, called variously a "valve gear" or "rotary valve" or "drop cut-off," which enabled engineers not only to keep the speed of the engine much more uniform than before but to regulate the speed in accordance with the requirements of the particular factory. Spindles and looms, for example, could be driven continuously at the speed required for the best type of product. In addition to affording evenness of operation, the Corliss engine permitted appreciable economies in fuel utilization.

The third chief type of prime mover, the internal-combustion engine, was not developed to practical use during the period before the Civil War, but a great deal of experimentation was being done with the idea of moving a piston by means of expanding gases. In fact, ever since 1678, when the Abbé de Hautefeuille used an explosion of gunpowder to drive a piston in a cylinder, men had been working on the problem.

In considering the progress made during this period, it must be remembered that the difficulty of working metal to exact dimensions retarded the development of prime movers. In the early steam engines, for example, the lever beams, the arms and shafts of the fly wheels, the bearings, and even the boilers and other parts were made of wood. Advances in engine design depended in part on improvements in iron working.

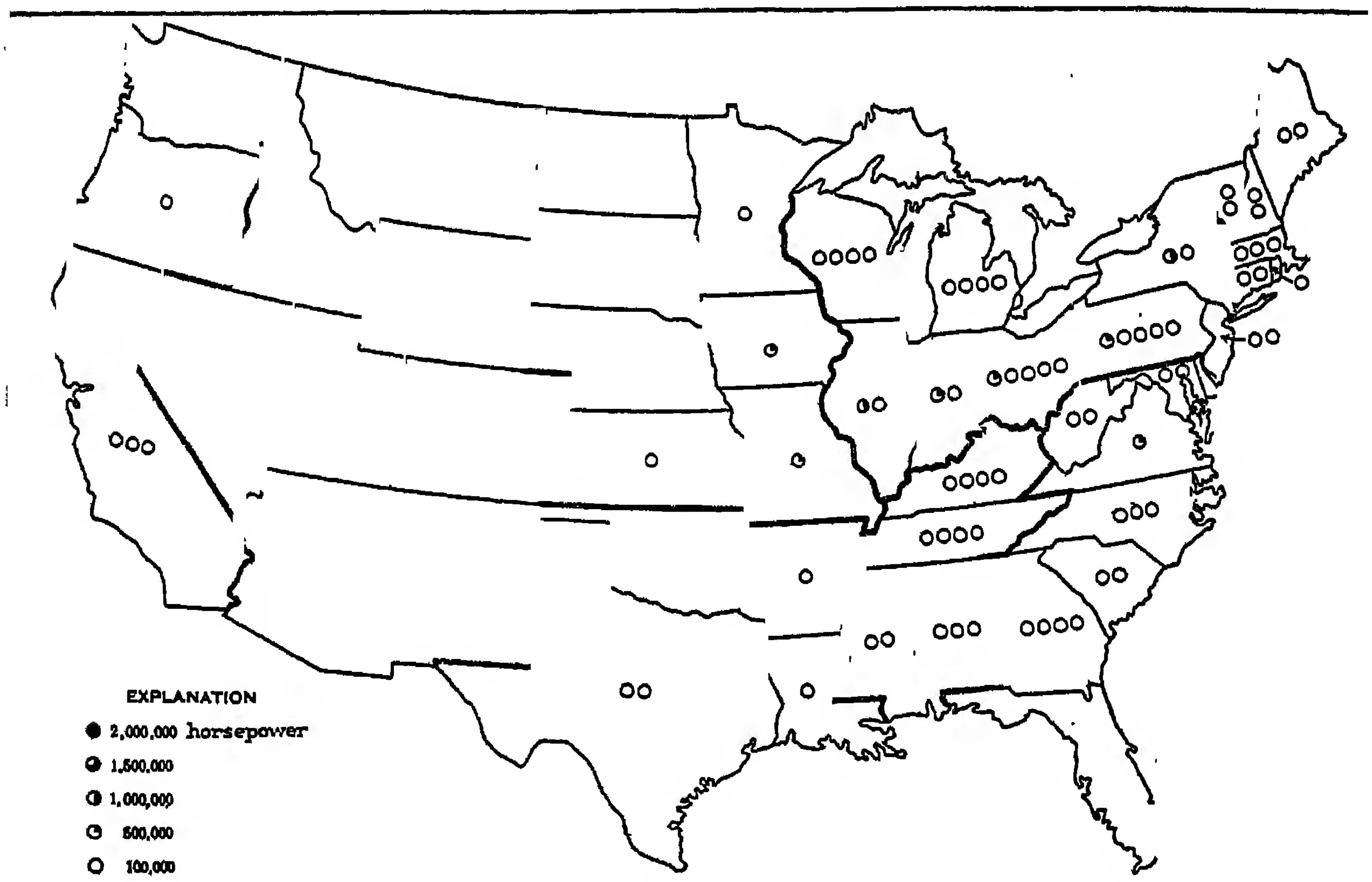
III. It is since 1860 that the most rapid strides have been made in power development. Technical advances in subsidiary industries and new demands for power made by the growing industrialism of the country have furnished ample impetus.

One outstanding invention has appeared in the field of water power. This was the Pelton wheel, first used successfully in 1884 at the Chollar mine, in the Sierra Nevada.

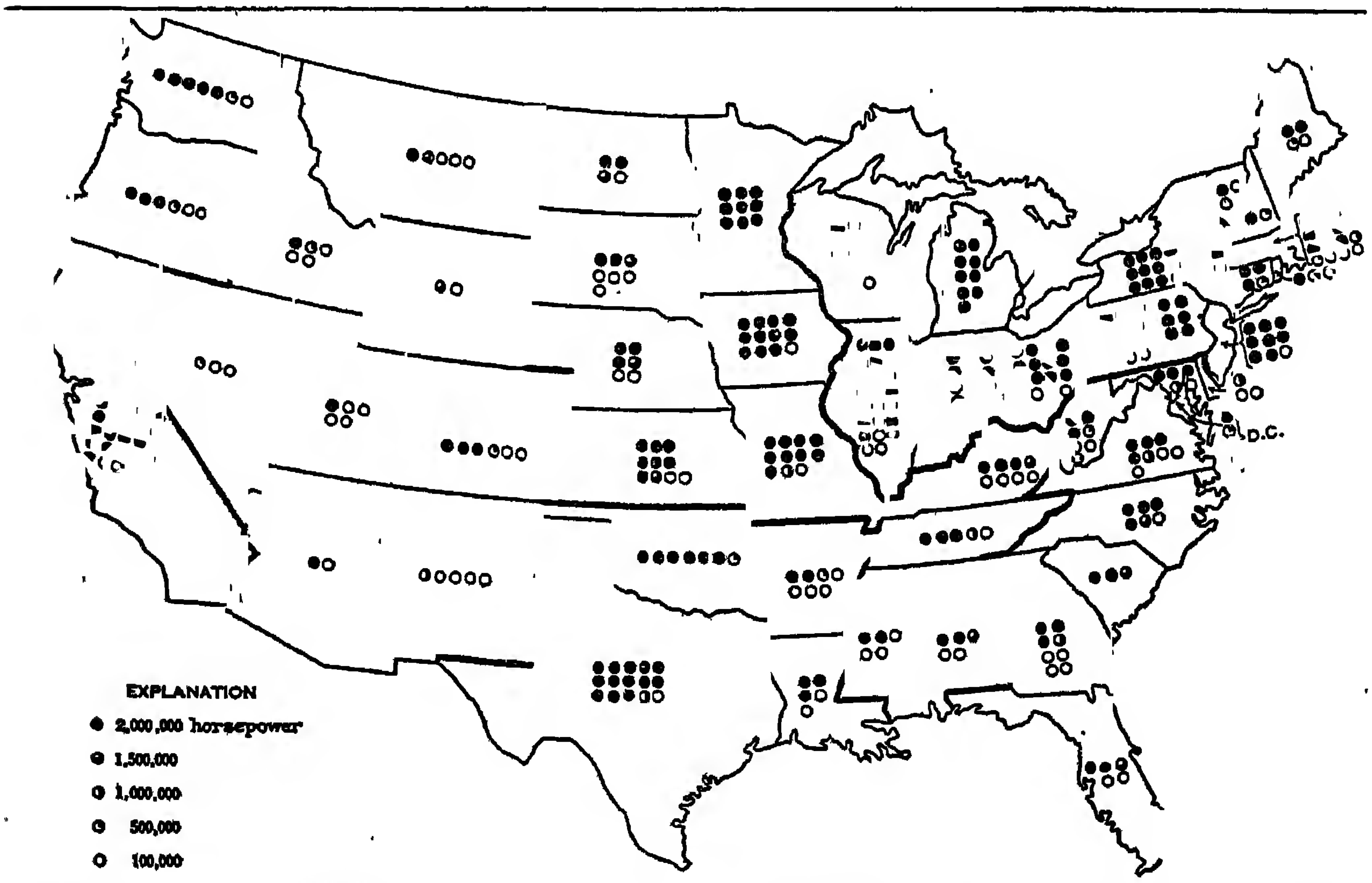
The steam turbine was the major development in steam utilization during the later half of the nineteenth century. Engineers had experimented with the idea ever since Hero, of Egypt, had made his crude toy about 100 B. C., but it had never been of practical use because of its high speed. Not until the high-speed electric generator was invented did it find extensive employment.

An extremely interesting development of recent date is the use of mercury vapor instead of steam to operate turbines. Mercury is va-

porized in a specially constructed boiler, passes through a turbine, where it does useful work, and exhausts into a surface condenser, where its latent heat is used to make steam that drives an ordinary

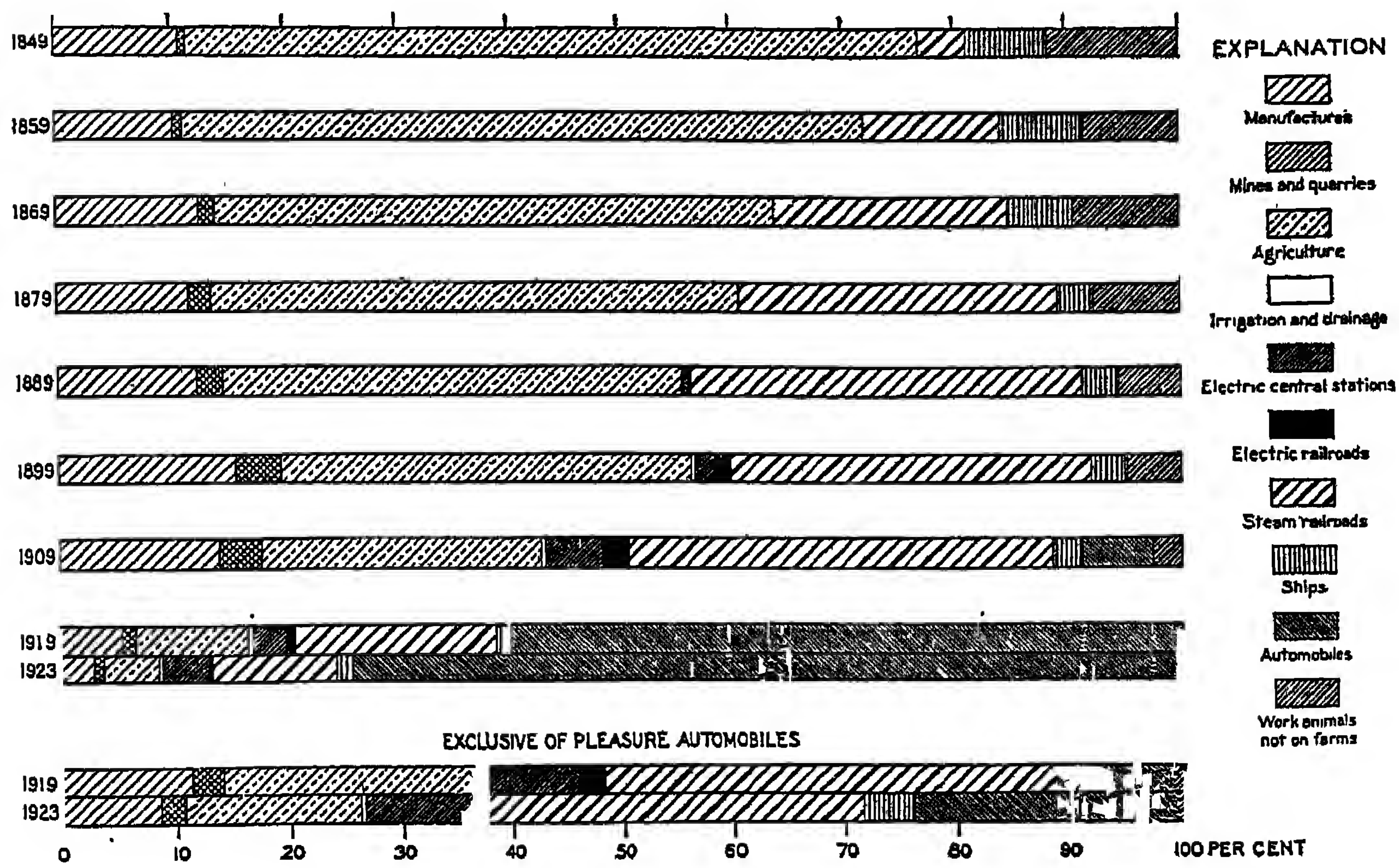


Total Horse-Power of Prime Movers, 1869



Total Horse-Power of Prime Movers, 1923

turbine. The condensed mercury is returned to the boiler and used again. The advantage of this system is due to the facts that mercury can be heated to a high temperature without developing excessive pressure and that the heat of condensation can be utilized for making steam at pressure desirable for use. The utmost care, however, must be exercised to prevent the escape of the highly poisonous mercury vapor. A system of this type was installed in 1923 by the Hartford (Conn.) Electric Light & Power Co. It is reported that the experi-

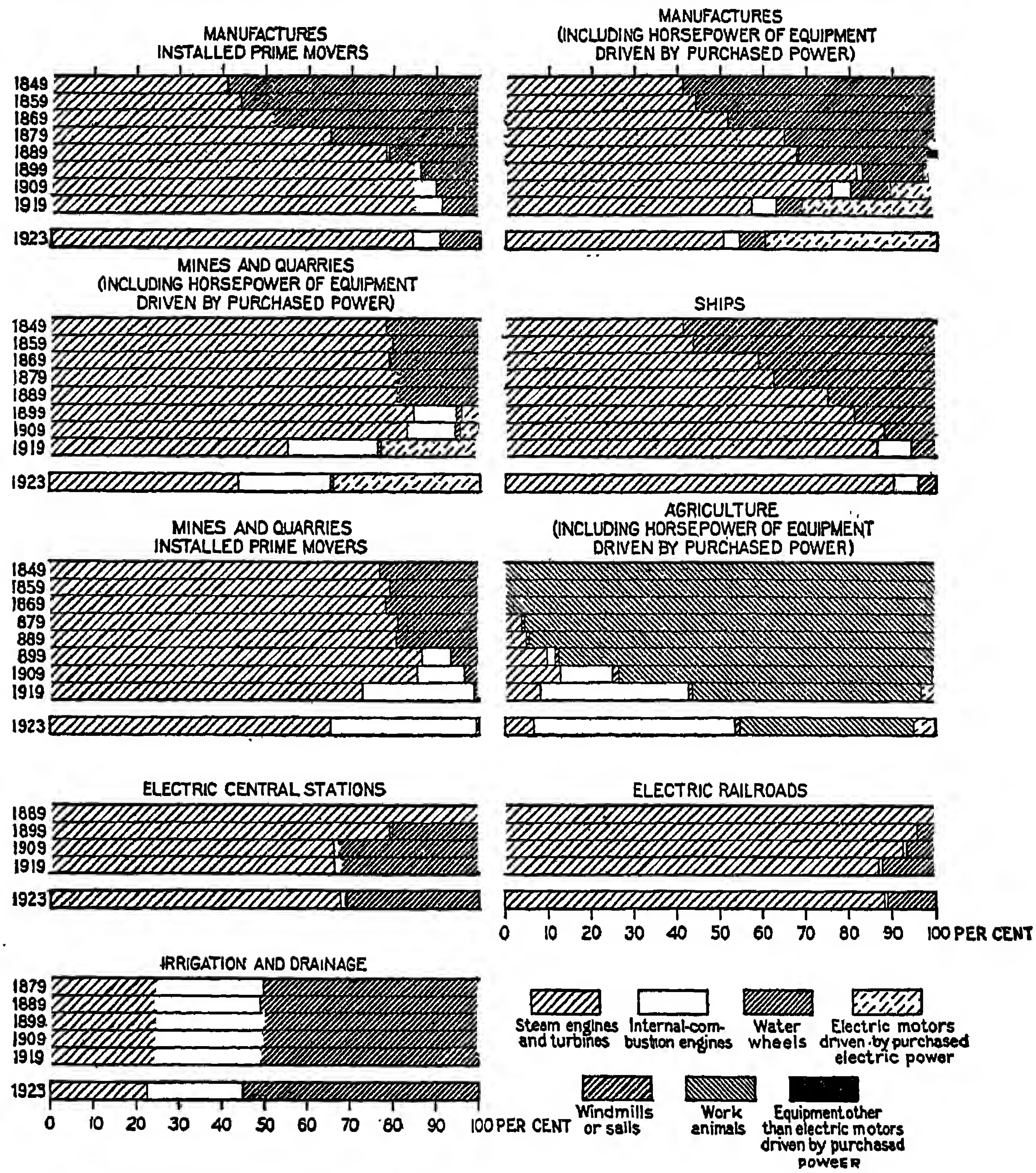


HORSE-POWER OF PRIME MOVERS INSTALLED IN DIFFERENT ACTIVITIES, 1849–1923

ment has proved highly successful and that the fuel bill has been about halved.

The internal-combustion engine was developed about the time of the Civil War. The Lenoir motor, which marked a distinct epoch in gas-engine construction, appeared in 1860 and was the first engine of this type that performed with relative smoothness and efficiency; but it used fuel rather wastefully. The Lenoir engine was followed in 1862 by an engine invented by Beau de Rochas, who introduced the modern system of four-cycle operation. This engine was placed on the market in 1878 by Otto, after whom the four-cycle idea is sometimes named. In 1879 Clerk brought out his two-cycle engine. Both these types are used to-day, but the four-cycle engine is the prevailing type.

Many small improvements have been effected in these engines, but there has been only one notable and significant development in the internal-combustion field since 1880—the Diesel engine, which uti-

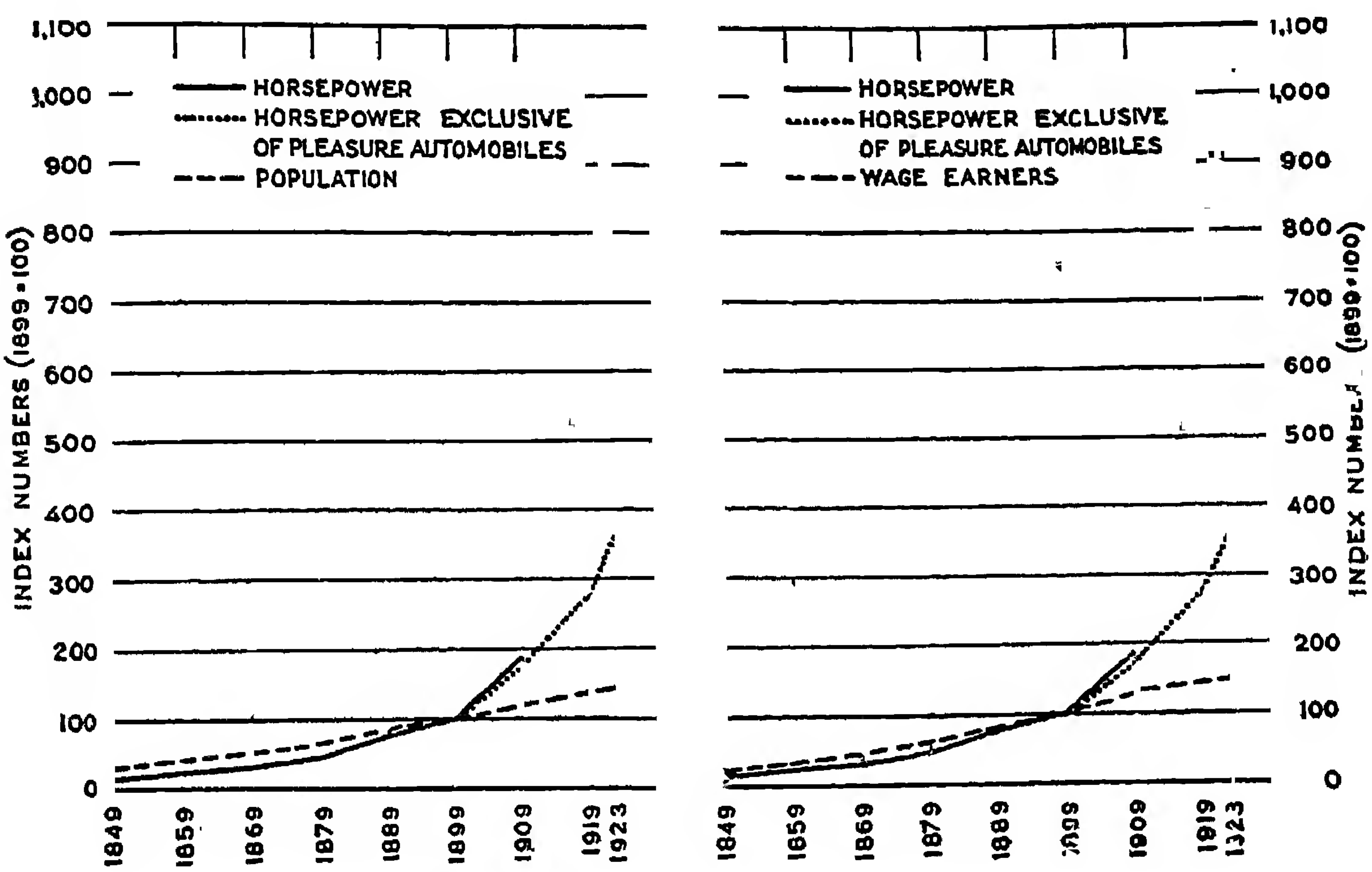


HORSE-POWER OF PRIME MOVERS INSTALLED AND UTILIZED IN DIFFERENT ACTIVITIES, 1849–1923, BY TYPES OF PRIME MOVERS

lizes the four-cycle principle. The chief difference of the Diesel from other internal-combustion engines is that instead of an electric spark being used to ignite a charge of fuel vapor, injected air is so greatly compressed in the cylinder that its heat fires the fuel, which is injected into the cylinder at the completion of compression. Great economies

are claimed for the Diesel motor, one of which is that heavy oils may be used to advantage.

The chief use of the internal-combustion engine has been in the province of transportation, where its advantages are obvious. It has failed to advance as a source of electric generation, mainly because to build it in the large units required in central stations has been impossible. Diesel engines, however, are gradually being increased in size and are successfully competing with steam-driven prime movers.



Horse-Power of Prime Movers, Population, and Wage-Earners in the United States, 1849–1923

Remarkable as has been the growth in the total capacity of this kind of prime mover and supreme as it is in its own field, another equally outstanding power achievement since 1860 has been the development of electricity. In many ways electricity is unsurpassed as a form of power. The electric generator and the electric motor are, of course, not prime movers, but the current produced by one and used by the other has enabled this country to use sources of power which otherwise would be largely untouched and to put this energy at the disposal of almost every inhabitant.

The first electric central station in the United States was the one built by Edison at New York City in 1882. The current in this and all

the other early plants was used for lighting. Industrial uses were to come later. The first hydroelectric station began operation in the same year at Appleton, Wis. In 1885, at Great Barrington, Mass., a notable advance was made in the first successful commercial use of alternating current for lighting. The year 1887 saw the first electric street railway in this country in operation at Richmond, Va.

Most of the developments in the field of electricity, however, have been made in connection with transmission. These improvements have paved the way for what some choose to call "the second industrial revolution" and have made possible the location of factories at comparatively long distances from the sources of power. The transformer idea was contributed by Faraday about 1845, but it was of no practical use until 1888, when Tesla invented both the multiple transformer and the polyphase electric motor for alternating current of high frequency.

As regards the total horsepower of prime movers installed in the different industrial activities in this country for each census year from 1849 to 1923, from 10 millions it has grown to the astonishing total of 682 millions of horsepower, more than sixty-eight times as much. Each decade has witnessed a steady increase, but since 1899 the development has been marvelous. Before that time the increase in any 20-year period had never been much more than twofold, but in the 20 years from 1899 to 1919 the growth was more than sixfold. Only four years later, in 1923, the total was over ten times that for 1899. The chief reason for this recent enormous growth is the increasingly extensive use of the internal-combustion engine in the pleasure automobile. Over 450 million horsepower, or almost two-thirds of the 1923 total, belongs to this class.

It is at once apparent that there has been a remarkable increase in motor-driven vehicles. The next largest increase in capacity of prime movers is in electric central stations, which show a gain from 120,000 horsepower in 1899 to 22,000,000 in 1923. Second in rank in total capacity to automobiles come steam locomotives, indicating the importance of railroad transportation.

Agriculture ranks third in capacity of prime movers. Up to 1869 and later more than half of the total capacity of prime movers in all activities was installed and utilized in agriculture. The vast industrial

development in the United States that was well under way at the beginning of the century called for so much power that prime movers in agriculture gradually became of relatively less importance in each decade, but nevertheless the capacity of prime movers in agriculture still holds third place.

TABLE I

Total Horsepower of Prime Movers in the United States, 1849–1923

TOTAL

Year	Horsepower	Index No. (1899 = 100)
1849	10,066,000	16
1859	15,793,000	25
1869	19,147,000	30
1879	28,820,000	45
1889	47,697,000	74
1899	64,193,000	100
1909	120,331,000	187
1919	396,118,000	617
1923	684,044,000	1,066
EXCLUSIVE OF PLEASURE AUTOMOBILES		
1899	64,161,000	100
1909	112,873,000	176
1919	176,650,000	275
1923	230,514,000	359

In general, transportation activities have increased more rapidly than the activities that produce "form utilities"—manufactures, mines and quarries, and agriculture.

A second manner of analysis concerns itself with the growth of horsepower equipment among the different types of prime movers. It is evident that the most rapid development has taken place in internal-combustion engines. Steam power, which is still the country's greatest single prime mover, has developed steadily but not so rapidly as water power. Undoubtedly hydroelectic developments have caused the rapid rate of growth since 1899. Windmills have never been of much importance, although their use has gradually increased.

Several main points of interest come to light in the percentage distribution of prime movers in each of the fields of activity. The in-

TABLE II

HORSEPOWER OF PRIME MOVERS INSTALLED IN DIFFERENT ACTIVITIES, 1849–1923

Year	Manufactures	Mines and Quarries	Agriculture	Irrigation and Drainage	Electric Central Stations	Electric Railroads	Steam Railroads	Ships	Automobiles	Work Animals Not On Farms	Total
HORSEPOWER (THOUSANDS)											
1849	1,100	50	6,597	......	......	......	435	734	....	1,150	10,066
1859	1,600	150	9,655	......	......	......	1,940	1,142	....	1,306	15,793
1869	2,346	350	9,588	......	......	......	4,100	1,076	....	1,687	19,147
1879	3,411	650	13,764	5	......	......	7,720	1,110	....	2,160	28,820
1889	5,850	1,300	19,835	33	120	140	16,300	1,444	....	2,675	47,697
1899	9,778	2,754	23,519	120	1,200	935	20,900	1,900	32	3,055	64,193
1909	16,803	4,403	30,807	361	5,225	3,091	45,400	3,122	7,714	3,405	120,331
1919	20,063	5,112	39,222	816	15,250	4,360	72,300	6,584	230,432	1,979	396,118
1923	19,728	5,000	38,100	1,300	22,000	4,100	74,600	10,262	507,254	1,700	684,044
HORSEPOWER, EXCLUSIVE OF PLEASURE AUTOMOBILES (THOUSANDS)											
1899	9,778	2,754	23,519	120	1,200	935	20,900	1,900	0	3,055	64,161
1909	16,803	4,403	30,807	361	5,225	3,091	45,400	3,122	256	3,405	112,873
1919	20,063	5,112	39,222	816	15,250	4,360	72,300	6,584	10,964	1,979	176,650
1923	19,728	5,000	38,100	1,300	22,000	4,100	74,600	10,262	53,724	1,700	230,514
PERCENTAGE OF EACH YEAR'S TOTAL											
1849	10.90	0.50	65.52	......	......	......	4.30	7.30	....	11.48	100.00
1859	10.12	.94	61.18	......	......	......	12.26	7.24	....	8.26	100.00
1869	12.24	1.83	50.03	......	......	......	21.37	5.72	....	8.81	100.00
1879	11.82	2.26	47.77	0.02	......	......	26.81	3.86	....	7.46	100.00
1889	12.24	2.73	41.60	.07	0.25	0.29	34.19	3.03	....	5.60	100.00
1899	15.23	4.28	36.63	.19	1.87	1.46	32.57	2.96	0.05	4.76	100.00
1909	13.98	3.66	25.62	.30	4.33	2.57	37.73	2.59	6.41	2.83	100.00
1919	5.05	1.29	9.90	.21	3.85	1.10	18.25	1.66	58.20	.49	100.00
1923	2.89	.73	5.57	.19	3.22	.60	10.91	1.50	74.14	.25	100.00
PERCENTAGE, EXCLUSIVE OF PLEASURE AUTOMOBILES											
1899	15.24	4.29	36.66	0.19	1.87	1.46	32.57	2.96	0	4.76	100.00
1909	14.89	3.90	27.29	.32	4.63	2.73	40.22	2.77	.23	3.02	100.00
1919	11.32	2.88	22.23	.46	8.63	2.47	40.92	3.76	6.21	1.12	100.00
1923	8.57	2.17	16.51	.57	9.55	1.78	32.34	4.46	23.31	.74	100.00
INDEX NUMBERS (1899=100)											
1849	11	2	28	......	......	......	2	39	....	38	16
1859	16	5	41	......	......	......	9	60	....	43	25
1869	24	13	41	......	......	......	20	57	....	55	30
1879	36	24	59	4	......	......	37	58	....	71	45
1889	60	47	84	28	10	15	78	76	....	88	74
1899	100	100	100	100	100	100	100	100	100	100	100
1909	172	160	131	301	435	330	217	164	24,106	111	187
1919	205	186	167	680	1,271	466	346	347	720,100	65	617
1923	202	182	162	1,083	1,832	438	357	540	1,585,169	56	1,065
INDEX NUMBERS, EXCLUSIVE OF PLEASURE AUTOBOMILES											
1899	......	......	......	......	......	......	......	......	....	....	100
1909	......	......	......	......	......	......	......	......	100	....	176
1919	......	......	......	......	......	......	......	......	4,283	....	275
1923	......	......	......	......	......	......	......	......	20,986	....	359

creasing use of purchased electricity in manufactures and in mines and quarries is worthy of note. In agriculture work animals are still almost of first importance, being topped in 1923 only by internal-combustion equipment. Steam and purchased electricity are little used in agriculture, because they involve stationary power units, and most of the work on farms requires tractive force. Steam-driven prime movers form the chief type in electric central stations and electric-railroad power plants, although in the central stations water wheels amount to almost one-third of the total. The sailing vessel has been supplanted by the steam-driven ship ever since the Civil War. The use of internal-combustion engines for driving ships is increasing, and the horsepower of Diesel engines used to operate ships may reach a considerable figure, especially if there is no pronounced increase in the cost of fuel oil.

It is a striking fact that for more than 15 years so much more equipment has been installed for moving persons and goods from place to place than for making things. In so far as this difference is caused by equipment used for carrying the products of manufactures, mines and quarries, and agriculture, the conclusion that geographic specialization of production has gone far in this country is verified. And in so far as it is the result of equipment used for transporting persons, it may be cited as evidence supporting the conclusion that the citizens of this nation are enjoying unprecedented wealth and leisure, as shown especially by the figures for pleasure automobiles. Both conclusions are justified. It is interesting to speculate as to whether or not this immense amount of transportation equipment will not work toward a relocation of manufacturing industries with respect to markets and raw materials.

The purpose of this study is primarily to set forth the trends manifested in horsepower equipment, but in conclusion it may not be out of place to suggest a number of ways in which the power index may be employed. They may be enumerated as follows:

1. As a measure of general industrial growth.
2. As a measure of capital accumulation.
3. As a measure of mechanical development, by comparing the index of power equipment with indices or measures of (*a*) the supply of labor (or number of wage earners); (*b*) the volume of production; (*c*) the volume of production per

TABLE III

Horsepower of Prime Movers, 1849–1923, by Types of Prime Movers

TOTAL

Year	A. Horsepower (Thousands)						B. Percentage of Each Year's Total					C. Index Numbers (1899=100)				
	Steam Engines and Turbines	Internal Combustion Engines	Water Wheels	Windmills	Work Animals	Total	Steam Engines and Turbines	Internal Combustion Engines	Water Wheels	Windmills	Work Animals	Steam Engines and Turbines	Internal Combustion Engines	Water Wheels	Windmills	Work Animals
1849...	1,228	....	662	429	7,747	10,066	12.19	....	6.58	4.26	76.97	3	....	36	65	35
1859...	3,263	....	930	639	10,961	15,793	20.66	....	5.88	4.05	69.41	8	....	50	97	49
1869...	6,215	....	1,205	452	11,275	19,147	32.51	....	6.21	2.36	58.92	16	....	65	69	50
1879 ..	11,636	....	1,353	507	15,324	28,820	40.38	....	4.69	1.76	53.17	30	....	73	77	69
1889...	24,281	17	1,522	566	21,311	47,697	50.89	0.03	3.20	1.19	44.69	63	2	82	86	96
1899...	38,445	956	1,860	658	22,274	64,193	59.84	1.49	2.90	1.02	34.75	100	100	100	100	100
1909...	77,055	13,170	4,022	822	25,262	120,331	63.99	10.94	3.34	.68	21.05	200	1,378	216	125	113
1919...	116,380	247,031	7,650	836	24,221	396,118	29.43	62.32	1.92	.21	6.13	303	25,840	411	127	109
1923...	125,773	526,322	9,598	851	21,500	684,044	18.33	77.00	1.41	.12	3 14	327	55,055	516	129	97

EXCLUSIVE OF PLEASURE AUTOMOBILES

1899...	38,445	924	1,860	658	22,274	64,161	59.87	1.44	2.90	1.02	34.77	100	100	100	100	100
1909...	77,055	5,712	4,022	822	25,262	112,873	68.26	5.07	3.57	.73	22.37	200	618	216	125	113
1919...	116,380	27,563	7,650	836	24,221	176,650	66.00	15.56	4.33	.47	13.64	303	2,983	411	127	109
1923...	125,773	72,792	9,598	851	21,500	230,514	54.57	31.57	4.16	.37	9.33	327	7,878	516	129	97

wage earner; (*d*) the area of agricultural land in use; (*e*) the amount of wages per wage earner; (*f*) the capital invested per wage earner.

4. As a means of comparing these items for the United States as a whole with those for other countries and with those for individual States or districts of this country.

Three of these uses have been developed in the preceding pages. Frequent reference has been made to the one which heads the list. The same is true for the second one, if "capital" is taken to mean instruments of production, particularly machinery. It is recognized, of course, that the power index tells nothing about the degree of intricacy or the value of the machines and their products. For example, a dentist's machine uses much less power in relation to the value of the machine than a textile-weaving machine. The growth in power equipment has also been compared with the growth in population and in number of wage earners and found to have advanced much more rapidly—in other words, the amount of horsepower per wage earner has shown a steady and decided rise since 1849.

The increase in equipment may also be compared with the increase in volume of production. This is perhaps the chief use of the power index and certainly its chief claim to interest in the minds of contemporary business men and economists. If the volume of output has grown faster than the number of wage earners, the inference safely follows that production per wage earner has increased throughout the period. And if, at the same time, the amount of power equipment has increased, it may be assumed that this item, so closely associated with human labor in production, has been at least partly responsible for the increase in output. A still better way of getting at this correlation is to compare directly the growth in power per wage earner with growth in volume of production per wage earner. If both have increased together, it is safe to assume that a correlation exists—that the growth in power is to be largely credited with the growth in production.

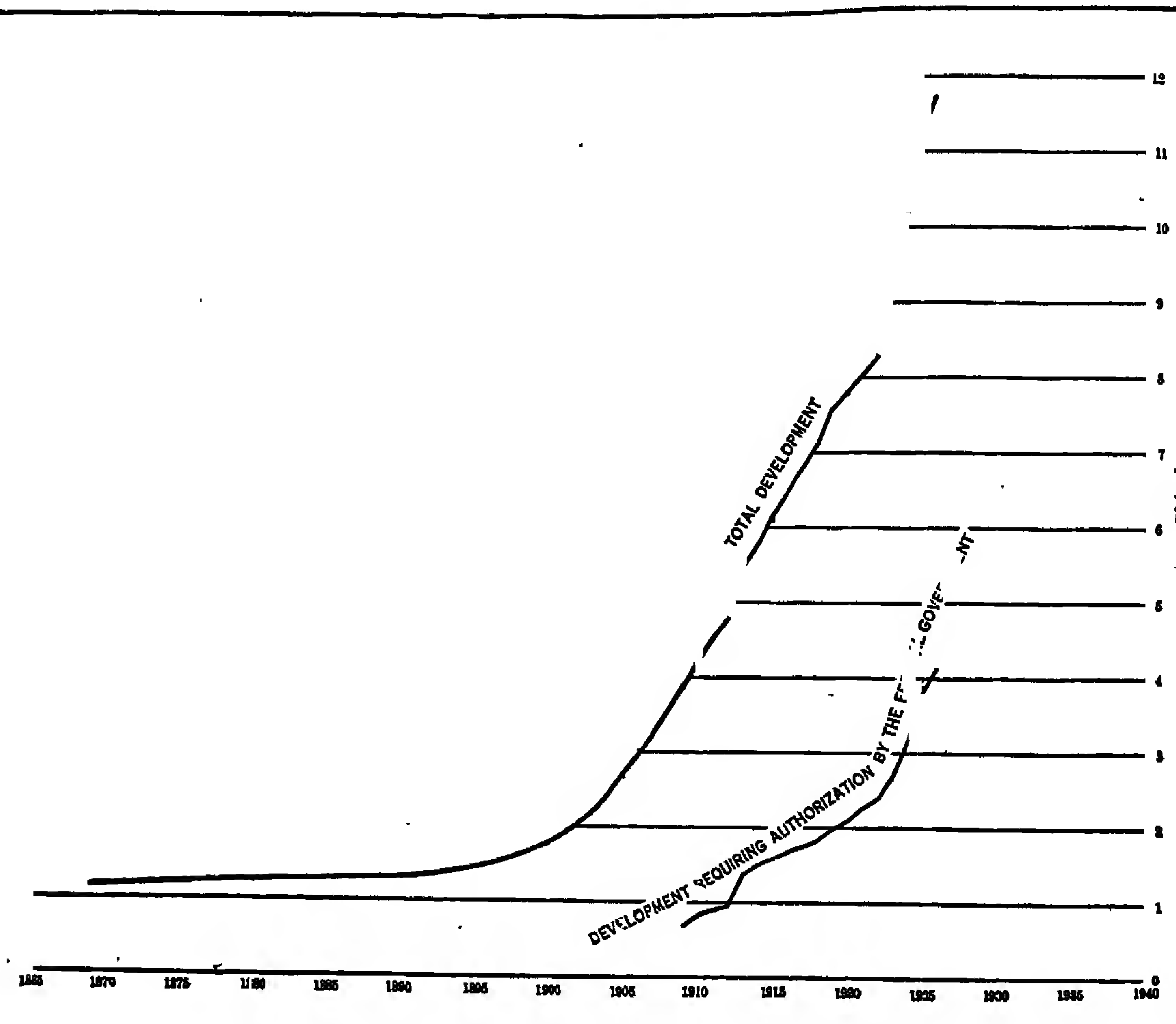
It is realized that other elements may also enter into the matter of increased output. The wider employment of approved management methods, the campaign against waste, improved organization, and better industrial relations have all undoubtedly helped to effect the

general result. But these elements were used in conjunction with more and better mechanical equipment.

See also "The World's Power Resources," page 329.

8. THE WATER-POWER SITUATION[11]

Notable activity in water-power development commenced in the nineties, when electric transmission of power became feasible and the hydroelectric plant became a factor in the generation of power, and

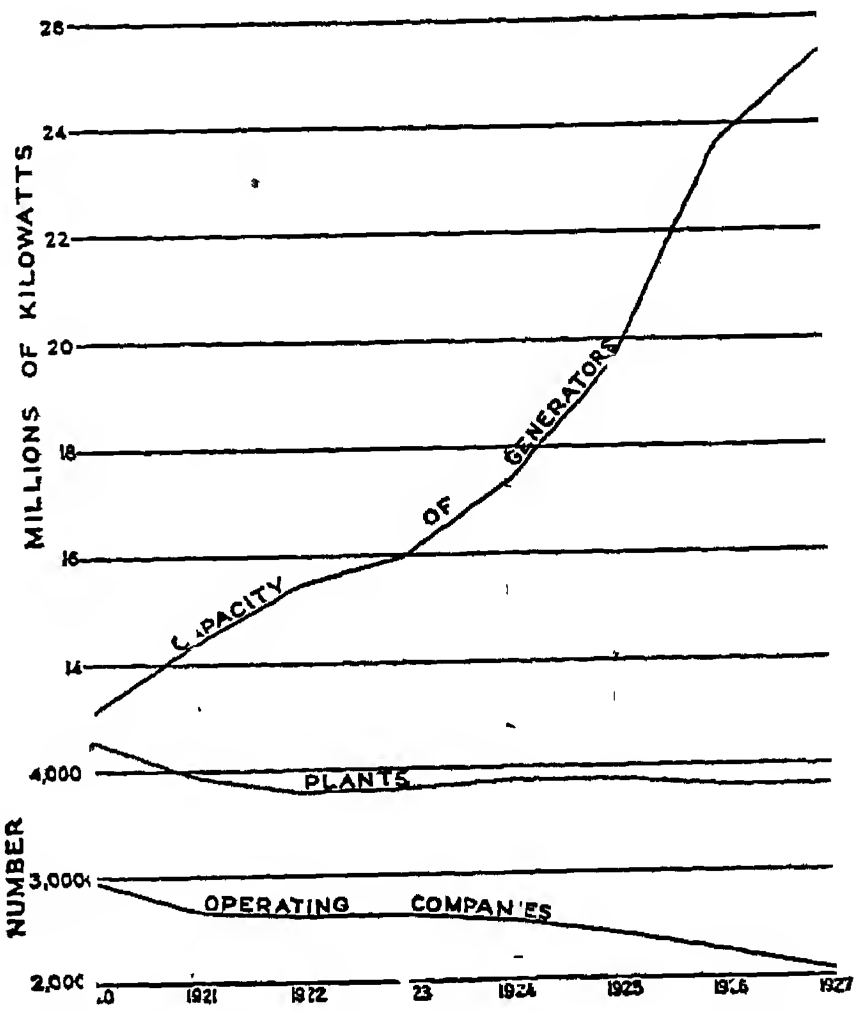


Growth of Water-Power Development in the United States

up to 1910 the rate of growth gradually increased. The annual growth from 1910 to 1923 was reasonably uniform except possibly in the years 1913 and 1919. The somewhat abnormally large development in 1913 is explained in part by the fact that it includes large installa-

[11] Adapted from R. W. Davenport, *Growth of Water-Power Development in the United States*, pp. 206–7. (Washington, D.C.: Department of the Interior, U.S. Government Printing Office, 1928.)

tions on Mississippi River at Keokuk, Iowa, and on Big Creek, Calif. Similarly, the result for 1919 is explained in part by a large additional installation at Niagara Falls. The great increase in development beginning with 1923 may be accounted for by several factors, the more influential of which are the increasing demand for power, the reaction from retarded growth during the war period, the stabilization of construction costs after the war, and, in 1920, the passage of the Federal water-power act, which afforded a more satisfactory basis for the development of projects requiring Federal authorization. Steady growth in water-power development appears to be assured for many years.



Electric Public-Utility Power Companies, 1920–26

The figures[12] of potential water power cannot be considered final, as future surveys and investigations will probably indicate additional feasible water-power sites and may also indicate changes in the potential power of present known sites. The development of storage reservoirs will also affect the estimates of power available. It is believed, however, that there will be no radical change in these estimates of potential water power by further surveys or investigations. From an investigation of the capacity of water wheels at fully developed water-power sites in different sections of the country and of the potential power available at the same sites it is estimated that on January 1, 1927, about one-seventh of the total potential power of the United States was developed. As the capacity of water wheels in plants of 100 horsepower or more was 11,721,000 horsepower on January 1, 1927,

[12] Adapted from A. H. Horton, *Developed and Potential Water Power in the United States and Monthly Production of Electricity by Public-Utility Power Plants, 1919–1926*, pp. 117–28. (Washington, D.C.: Department of the Interior, U.S. Government Printing Office, 1928.)

the total capacity of water wheels necessary to develop all the potential water power of the United States would be about 80,000,000 horsepower.

DEVELOPED WATER POWER IN THE UNITED STATES, 1927, AS SHOWN BY CAPACITY OF WATER WHEELS IN PLANTS OF 100 HORSEPOWER OR MORE

Division and State	Total		Public Utility and Municipal		Manufacturing and Miscellaneous	
	Number of Plants	Capacity in Horsepower	Number of Plants	Capacity in Horsepower	Number of Plants	Capacity in Horsepower
United States....	3,390	11,720,983	1,565	9,961,202	1,825	1,759,789
New England........	1,221	1,535,468	264	779,449	957	756,010
Middle Atlantic......	613	2,055,853	239	1,757,413	374	298,441
East North Central...	369	1,009,915	250	770,424	119	239,491
West North Central...	201	532,894	150	436,450	51	96,444
South Atlantic......	341	1,841,197	161	1,600,339	180	240,858
East South Central...	60	867,638	45	863,681	15	3,957
West South Central...	29	32,333	18	28,828	11	3,505
Mountain...........	245	1,030,224	196	1,010,743	49	19,481
Pacific..............	311	2,815,461	242	2,713,875	69	101,586

POTENTIAL WATER-POWER RESOURCES OF THE UNITED STATES, 1924

Division and State	Available 90 Per Cent of the Time		Available 50 Per Cent of the Time	
	Horsepower	Per Cent	Horsepower	Per Cent
United States........	34,818,000	100.00	55,030,000	100.00
New England............	998,000	2.87	1,978,000	3.60
Middle Atlantic..........	4,317,000	12.40	5,688,000	10.35
East North Central.......	737,000	2.12	1,391,000	2.53
West North Central.......	871,000	2.50	1,844,000	3.35
South Atlantic...........	2,476,000	7.11	4,464,000	8.11
East South Central.......	1,011,000	2.90	2,004,000	3.64
West South Central.......	434,000	1.25	888,000	1.61
Mountain................	10,736,000	30.83	15,513,000	28.19
Pacific..................	13,238,000	38.02	21,260,000	38.63

B. Some Examples of the Application of the New Technology

It adds to one's appreciation of the place of the power-driven machine (remember it is but a type case of the whole field of modern technology) in our modern economy if it is seen at work in several different activities. The sampling process must again be utilized. Transportation, storage, agriculture, and the printing industry will give us a fair range of samples.

The amazing contribution of modern technology to communication and transportation may be visualized by reflecting upon these facts; for five thousand centuries (up to Neolithic times) man had to depend upon his own powers and the simplest of tools for communication and transportation. His own legs, his own arms for paddling a canoe, the moccasin, fire signals, the drum—such equipment pictures the situation. Neolithic man added the beast of burden and later the wheel, to the list, and then for one hundred centuries little advance occurs. Up to say 1830, modern man had communicating and transporting devices which were but little more effective than those of Neolithic man. In other words, only for one century have we had effective devices in these fields of activity, and only in our own generation have we had such devices as the automobile, the aeroplane, the radio, and television. Five thousand centuries of wretched control of space, one hundred centuries of quite modest control, one century of considerable control, one generation of breath-taking control—the chronology parallels roughly the development of the basic technology.

In storage and warehousing the emphasis is upon the creation of time and place utilities, mainly time utilities. In part, these activities are concerned with carrying goods over from a time of their relative abundance to a time of their relative scarcity—and this means time utility. In part, these activities constitute a sort of supplement to transportation. They provide reservoirs for the accumulation of goods which are to be taken to another place, or they provide reservoirs from which goods are to be distributed—and in either event they are agencies in conferring place utility. It is true that in some warehouses a bit of processing is performed on materials passing through them, as when wheat is cleaned or mixed, nuts are polished, or goods are put into smaller packages. But such creation of form utility is an incidental function rather than the essential function in storage and warehousing.

The storage of non-perishable goods calls mainly for space, good transportation facilities, good protection from deterioration and theft, and responsible care. The storage of perishable goods, however, calls not only for mechanical facilities, but also for technology growing out of chemistry and bacteriology.

What lies back of the storage of perishable goods can be most easily seen by reflecting upon what is involved in the preservation of

foods. In this matter, as in so many other parts of man's economic progress, the simple practices of Neolithic man prevailed until about a century ago. Foods were dried or salted or pickled, and last of all canned—and all was done by rule-of-thumb, with no understanding of the underlying principles involved. Indeed, it was not until Pasteur's monumental work in bacteriology that it was realized that the essential element in food preservation is the prevention of the growth of bacteria, and that this may be accomplished *by sterilization*—whence the giant canning industry and the methods of preservation by the use of chemicals; or *by removing moisture*—whence the rapidly growing activities in dehydration; or *by cold*—whence refrigeration and all the manifold forms of cold storage. It is only in the last generation that man has had really effective control of his perishable foods.

It is one of our purposes to evaluate the place of active capital goods in the modern producing system. These capital goods have had their most striking development in such fields as manufacturing, transportation, communication, and mining. A far less striking development has occurred in such activities as marketing or agriculture. It will, accordingly, contribute to a balanced view of the place of active capital goods in the economic order if we examine how they condition agricultural production. It will be found that they condition agricultural activities in three respects: (1) by the part they play on the farm in agriculture proper; (2) by the part they play in providing contacts between the agriculturalist and the rest of society; and (3) by the part they play in providing supplies and equipment for the farm. The last two of these have already been considered to some extent, either directly or indirectly. As for the first, we are already familiar with the broad outlines of the situation. Up to a hundred years ago the active capital goods of the farmer were Neolithic in character except for the facts—important facts—that they were better in quality and more abundant in quantity. Within the last century all this has been changed; the power-driven machine has invaded farming, and it is a fair prediction that a more extensive mechanization of the farm is still to come.

The story of printing will be found to parallel in a rough way the technological developments in other fields. Although the printing press is almost 500 years old, there has been but one century of con-

siderable quantities of printing and only a generation or two of really abundant printing.

It will be well to read the selections of this section with the following issues[12a] in mind:

1. How trustworthy is the generalization that man has had *abundant* transportation and communication only in the last generation or two?
2. How trustworthy is a similar generalization as to storage and as to printing?
3. Can it be that man is now in the midst of a revolution in agriculture? If so, what are some of the happenings which are foreshadowed?
4. How trustworthy is the generalization that man is living in a new world since about 1880 or 1890? New, in what respects?
5. Should we anticipate for the future an increase or a decrease in man's ability to produce economic goods?

1. POWER AND THE MACHINE IN TRANSPORTATION

A. GENERAL STATEMENT[13]

Reduced to simplest terms, transportation is the carrying of goods, persons, or communications from place to place. It may be distinguished from transmission, which also has an idea of change of place. Transportation is the carrying of a commodity (including human being in that term), while transmission seems to be the transfer of energy.

Not only does transportation facilitate specialization, particularly of the territorial type, but transportation today is itself largely carried on by specialists. This has not always been the case. A few hundred years ago transportation was largely the work of merchants who went about the country selling goods, and carrying them in their own conveyances. In a somewhat similar way, even today there is a great deal of this "mercantile transportation." Retail stores, department stores, manufacturers, farmers, coal yards, milkmen, and numerous other business establishments have their own delivery outfits and transport their own sales. This today is largely true in what we may term the "local transport zone"; but formerly it prevailed everywhere.

[12a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 101–111. (University of Chicago Press.)

[13] Adapted from a statement prepared by Lewis C. Sorrell.

Not only has transportation largely become the work of specialists, but even within that field specialization is very evident. One noteworthy type of specialization in transport is based upon the kind of a "way" utilized, as *railway, waterway, highway,* and *airways.* Crude petroleum, for example, is pumped through pipes from wells to refineries often hundreds of miles distant; and so pipe-lines are still another instance of specialization. Still another type of specialization is evidenced by the distinction between "carrier agencies" and "non-carrier agencies" of transport. Fundamentally, transportation calls for a way or route, a carrying vehicle, and motive power. Under certain conditions one or more of these may be very primitive. An African porter is at once vehicle and motive power; and the path he picks through the jungle is certainly a very rudimentary way. On the Pacific Coast huge rafts of logs, carrying millions of feet of lumber are towed over the ocean; here the commodity itself forms its own vehicle in connection with the buoyancy of the material transported; the tug is the motive power, and the untracked ocean the way. The railway happens to be an instance where usually (but not always) all three of these factors, way, vehicle, and power, are under one ownership and control. This should not obscure the fact, however, that in the case of many other transportation agencies one specialist may furnish the way, another the vehicle, and still a third a motive power. A canal company may provide the waterway; the owner of the goods may supply a barge; and towing specialist may furnish the tug-boat. In such cases the canal and towing companies are non-carrier agencies of transport.

Although the development of our economic order during the last one hundred and fifty years has witnessed the transfer of the transport function largely to transportation specialists, it must be remembered that much transport still remains with the non-specialist. The case of merchant-carriers was instanced above. Even a better example is the case of government agencies. Many of the transportation instrumentalities today are owned and operated by central, state, local or city governments. These governments can hardly be called transportation specialists, because they have many other activities to perform. Streets, highways, canals, and river improvements are generally the work of governments today; and in some countries steam railways

are owned and operated by governmental authority. No enumeration of transportation agencies would be complete that did not accord to our governments a generous recognition of the part they have played in furnishing transport instruments.

Three further instances of specialization remain to be noted. First comes the distinction between local and long distance transportation. The line of demarcation is not easy to draw. But it is evident that street, subway and elevated railways, motor coach companies and drayage concerns largely confine themselves to the hauling of persons and goods about the city or locality. On the other hand, while steam railways and electric interurban lines do handle some commutation traffic, for the most part they depend upon hauling traffic beyond the city and its surrounding tributary area. Second may be mentioned the distinction between common and private carriers, which is largely a legal one. By common carriers lawyers mean persons (natural or artificial) who hold themselves out to the public to carry goods or persons for hire for any who offer them employment. They are largely specialists in transportation. Private carriers, however, agree to haul goods only for certain persons: they, too, *may* be transportation specialists. Third, the development of transportation has carried with it the growth of certain firms who specialize largely in the sale of transportation services. In a sense they are middlemen between the transportation agents, and the public that employs them.

The following condensed classification of transportation agents may assist in giving a clearer notion of the specialization discussed above.

A. Non-Carrier transport agencies: (i.e., not engaged actually in carrying goods or persons, but furnishing some of the required facilities)
   a) Natural agents—waterways, such as rivers, lakes, oceans, with their tides, currents, winds, etc.
   b) Canal companies
   c) Turnpike companies
   d) Bridge companies
   e) Wharfingers (furnishing wharves for steamships)
   f) Towage companies
   g) Governments, federal, state, local, city to the extent that they construct, maintain, and operate canals, roads, streets, bridges, river and harbor improvements, and wharves; also where they own but do not operate railways, steamships

B. Carrier transport agencies
- *a*) Companies of porters
- *b*) Packhorse companies
- *c*) Drayage or carting concerns
- *d*) Motor coach or bus operators
- *e*) Electric interurbans
- *f*) Street, elevated and subways companies
- *g*) Taxicab companies
- *h*) Steam railways
- *i*) Steamship companies
- *j*) Express companies
- *k*) Pipe line companies
- *l*) Ferry companies
- *m*) Aviation companies
- *n*) Governments, federal, state, local or city to the extent they operate railways, steamship lines, ferries
  The post-office belongs to this group
- *o*) Merchant carriers by rail, steamship, or highway

C. Agents for marketing transportation services
- *a*) Freight forwarders
- *b*) Ticket scalpers or brokers
- *c*) Tourist agencies
- *d*) Ship and freight brokers
- *e*) Steamship agencies

See also:
"Technical Requisites for the Transportation of Goods," page 159.
"Travel in the Middle Ages," page 161.
"Carriers and Communicators 1660–1760," page 163.

B. INTERNAL TRANSPORTATION[14]

It may be of interest to glance over a selected list of devices now available that tend to eliminate waste prevalent in handling, transporting, storing and weighing materials, and for rendering quick service in communication of intelligence.

[14] From "Rehabilitation of Existing Plants as a Factor in Production Costs," by Harold V. Coes, in *Engineering Magazine*, (1915), XLIX, 573–74.

Trucks and Cars:
- Automatic trucks
- Mechanical transveyors (hand)
- Mechanical transveyors (power)
- Storage battery or gasoline trucks

Industrial Cars:
- Gasoline operated shifting or switch engines

Cranes and Telphers:
- Traveling bridges and monorail carriages
- Telphers
- Wall cranes
- Jib cranes
- Jib cranes (portable)
- Unloaders (stationary)
- Unloaders (traveling)
- Locomotive cranes (steam)
- Locomotive cranes (electric)

Conveyors:
- Pneumatic
- Belt
- Bucket
- Slat
- Drag chain
- Gravity
- Sectional power
- Unloading
- Piling and tiering
- Interveyors

Weighing devices:
- Direct reading scales
- Track scales
- Automatic scales
- Portable scales
- Belt conveyor integrating scales
- Monorail or telpher section scales
- Crane scales

Hoists:
- Triplex chain
- Electric
- Air
- Steam
- Hydraulic

Elevators:
- Portable
- Hydraulic
- Air
- Steam
- Dumb waiters
- Inclined

Carrier systems:
- Cash carriers
- Tool carriers
- Correspondence carriers
- Books and paper carriers
- Bag carriers

Miscellaneous apparatus:
- Portable revolving elevators
- Movable or traveling platforms
- Interphones
- Autocalls and whistles
- Annunciator systems
- Speaking tube systems, etc.
- Mechanical or moving stairs

C. THE AUTOMOBILE AND GOOD ROADS[15]

With the coming of the automobile, rural highways have assumed a new importance in the transportation facilities of the country. To meet this need roads have been graded and surfaces improved. By 1921, 13 per cent. of the total rural road mileage of the country had

[15] Adapted from "Progress of Rural Highway Construction in the United States," *Commerce Monthly,* VII, No. 5 (September, 1925), 22–23. (The National Bank of Commerce.)

some sort of surface dressing as compared with 7 per cent. in 1904. The proportion now must be considerably larger as since that time resurfacing has been proceeding at the rate of 35,000 to 40,000 miles per year while during the earlier period the average rate was only 13,800 miles.

The magnitude of the whole undertaking is evidenced by the expenditure in recent years of nearly a billion dollars annually for construction, maintenance and all other charges. The expenditure of so large an amount of money is not without effect upon the labor and material markets of the country, while the raising of the funds has contributed to the volume of tax-free bonds absorbed by investors.

The improvement of road surfacing is not a matter of comfort alone to the motorist. It is estimated that the cost of fuel is 40 per cent. greater in driving a car over a dirt road than over a surfaced one and the total increased cost, allowing for wear and tear, is around 25 per cent. While the growing use of automobiles has added greatly to the desire and need for better roads, the relationship has not been entirely one-sided. It may be said with equal truth that the expanding network of hard-surfaced rural roads has contributed to the demand for motor vehicles. In fact, outside of city limits the commercial use of trucks and buses for the transportation of freight and passengers, a phase of motor-car development which has come to have considerable effect upon the short-haul business of railroads and trolley lines, is practically dependent upon durable hard-surfaced roads. The use of trucks by farmers is likewise aided by the improvement of rural roads.

Efforts in the early days of the country's history to establish a national system of roads for communication and transportation were superseded by the development of railroads. Thereafter highway traffic became largely local in character and the roads of the country were laid out chiefly to meet local needs. Moreover, throughout the nineteenth century horse-drawn vehicles were so predominant in traffic that outside of towns and cities the cost of even a gravel surface was usually quite out of proportion to any need that was felt for it.

About thirty years ago, before automobiles had become sufficiently numerous to forecast their importance in the situation, a desire arose in some of the more progressive communities for roads sufficiently well made to give good service the year round, and a start was

made in selecting for improvement some of the most traveled main roads. The rapid growth in number of automobiles has given tremendous impetus to this movement and has brought rural highways back into a position of importance in the national system of transportation and communication.

With the realization that under the new conditions through or trunk routes are of far more than local importance has come gradually a move to take the building and control of such routes out of the hands of local authorities. To this end routes have been selected in nearly all the states and incorporated into state highway systems administered and controlled directly by a state authority with a considerable share of financial contribution from the state.

The national aspect of the road problem has been recognized by the Federal Government, which since 1916 has been taking an active part in highway development by granting financial aid for construction projects. The funds so furnished are and must be used by or under the supervision of a state highway department, thus insuring a unified and responsible administration. Federal control in the use of the funds is secured by the supervision of the construction on each project. Federal aid may not cover more than half the cost of a single project except in states where unappropriated lands amount to more than 5 per cent. of the total area. One-third of the fund available from the Government is apportioned among the states in proportion to their respective areas in relation to the total area of the country, one-third in proportion to the mileage of rural delivery and star routes.

Up to June 30, 1924, the Federal Government had contributed $353,000,000 toward highway construction. That no excessive burden was laid upon the Government in this expenditure is evident, however, from the fact that to the same date Federal receipts from taxes on the sales of motor vehicles and accessories and on passenger cars for hire had totaled $749,000,000.

D. THE MOTOR TRUCK[16]

The motor truck has nearly displaced the horse-drawn vehicle in many types of short distance hauling. For longer distances it competes

[16] Adapted from "The Motor Truck as a Factor in the Transportation System," *Commerce Monthly,* VI, No. 7 (November, 1924), 3–5. (National Bank of Commerce.)

with the railroads to some extent, but its greatest field for usefulness is as a supplement to them. Certain types of traffic can now be handled more satisfactorily by motor truck than in any other manner.

Several factors determine which type of transportation will be most economical in a particular case. Among them are distance to be covered, speed of delivery, quality of service, including regularity and continuity, character of goods transported, condition of the loads, and the availability of railroad service. Where all three types of transportation are available, distance to be covered is perhaps the outstanding factor determining the relative cost of horse, motor or rail transportation. Transportation by water is not taken into consideration here because the conditions are limited under which water transportation and transportation by motor truck may compete.

The greater speed and endurance, and consequent greater radius of activity, of the motor truck have superseded the horse in all excepting some special forms of short-haul transportation. The horse population of the large cities in the United States declined more than 60 per cent. during the ten years from 1910 to 1920. There is still a place for the horse in commercial activities for there are conditions under which horse-drawn delivery wagons are more convenient and economical than motor vehicles, as for instance on milk and ice routes. Many horse-drawn vehicles are also used in city express service.

In rural hauling the greater speed and range of motor trucks have been of particular advantage.

In the opinion of many of the best authorities, the ideal relation of the motor truck to the railway is that one should supplement the other. The motor truck may be applied to the solution of railroad problems in the following ways:

1. As a feeder, either on lines of light traffic, or in territories where the volume of traffic has not heretofore justified the construction of railway branch line feeders.

2. As a substitute for the railroad in short haul or local service, which frequently is an unprofitable service rendered by the railroads and a drain on profits derived from other sources.

3. As a solution of terminal problems, reducing or doing away with the movement of freight by car between stations within the same terminal area, and costly switching operations.

4. The motor bus or the gasoline rail car, literally a modification of the motor bus, may be substituted for the railway passenger train on lines of light passenger traffic.

E. HOW BUSINESS USES AIR TRANSPORTATION[17]

A terse and valuable leaflet summing up the present position of air service to business has been published by the Committee on Aeronautics of the Chamber of Commerce of the United States.

This Committee's survey of a number of banks, insurance companies and business concerns located on air mail and express routes, showed that 96 per cent. utilized the service. The extent of use of air mail and express reported is as follows:

Extensive or daily use by 40 per cent. of concerns reporting; limited or occasional use by 41 per cent. of concerns reporting; extent of use not stated by 15 per cent. of concerns reporting; not used by 4 per cent. of concerns reporting.

As shown in the survey, some of the principal articles sent by air are:

BY BANKS

Checks, drafts and notes for collection and credit, saving interest charges on funds in transit.

Advices of payment of drafts, etc.

Important and rush letters.

Letters to connect with mail to Europe and other foreign destinations.

Shipping documents.

Securities.

BY INSURANCE COMPANIES

Letters, including authorizations, releases, etc.

Applications, policy contracts, and proofs of loss.

Daily reports, card records, monthly accounts and statistical statements.

All policies to distant offices.

Small and urgent supplies to agents.

Checks for claims, policy loans and cash values.

Surety and contract bonds, legal papers, farm mortgages and occasional securities.

Reinsurance claims.

BY BUSINESS HOUSES

Contract and credit letters, documents and sales promotion materials.

Advertising proofs and copy of proof for approval.

[17] Adapted from "How Business Uses Air Transportation," *Executive Service Bulletin,* March, 1929, p. 7. (Metropolitan Life Insurance Company.)

News pictures and photographic mats.
Small packages.
Repair parts.
Announcements of new products.
Rush shipments of samples and "out of stock" merchandise.

2. THE CABLE AND INTERNATIONAL TRADE[18]

Fifty years ago each country, and especially each continent, was in large degree an independent commercial unit. While international trade over great distances was important, it was specialized in character and essential to the business life of only a few countries. Even yet the world has not completely become an economic unit, but it has made notable development in that direction largely as the result of two factors, the introduction of the iron and steel steamship, which greatly increased the size of cargo carriers and made cheap freight rates possible, and the invention of the submarine cable.

Besides the phenomenal increase in volume of business brought about by the extension of telegraphic service across the oceans, this quickened communication also wrought a complete change in business methods, and introduced an element of stability into international trade which it lacked when intercourse depended solely on the mails. Until the cable was available the importer was compelled to place his orders without current quotations either of the market in which he had to buy or of the market in which he proposed to sell. Within the memory of many men still active, every American importer who bought in Europe faced the risk involved in having his orders carried out more than a month after he had received his last information on market conditions abroad. So, too, if a sudden change in conditions here made it advisable to increase or decrease his orders, more than a month elapsed before he could be assured that his instructions had been obeyed. With other parts of the world the time required was even greater. In trade with the Orient, the best part of a year was necessary to complete a single transaction.

The result was apparent in the large margin of profit which was considered necessary. A considerable amount of capital was required, a high rate of turnover was impossible, and prices were necessarily

[18] Adapted from "International Cable Communication," *Commerce Monthly*, II, No. 7 (November, 1920), 3–4. (National Bank of Commerce.)

fixed to afford large profits as an insurance against the equally great losses which lack of market information sometimes made inevitable. It was the day of the clipper ship, indifferent mails, small transactions and relatively large profits. A large part of the foreign business before the advent of the cable was scarcely business, as the term is understood today, but speculation.

Under these conditions, strong import and export houses developed, and it was necessary to give these firms and their agencies the widest latitude in matters involving trading judgment. With the cable, it is now possible for the manufacturer, if he chooses, to export directly, and to keep in as intimate touch with his foreign business as he does with his domestic sales department. Producers who handle their foreign purchases or sales through import and export houses are likewise in so close a contact with transactions that foreign trade need not involve risks or difficulties essentially different from domestic transactions.

This great change is reflected in conditions in the markets for every commodity. These markets today are absolutely international. Wide fluctuations between prices in different markets have been eliminated and the speculative element in foreign trade has thereby been reduced to a minimum.

Notwithstanding the rapid development of radio telegraphy since the first trans-Atlantic signals were transmitted from England to Newfoundland on December 21, 1901, the bulk of international telegraphic business still passes over the cables. The war greatly stimulated the development of the radio, but wireless telegraphy still remains at a disadvantage as compared with the cables. The cable is dependable in its operation and its messages are secret, and, while the high-speed, mechanically operated radio stations are not greatly affected by atmospheric and magnetic conditions, their vibrations are spread broadcast so that a comparatively simple mechanism enables anyone to read them. The radio is in effect a party line, upon which the whole world may listen in.

See also "Concentration in the International Field," page 877.

3. THE EFFECTS OF MACHINERY UPON RURAL LIFE[19]

As long ago as the time of neolithic man, there were tools for working in the soil. There were the digging stick, the hoe, the flint shovel, the spade, the plow, and crude rakes for scratching the soil and making it finer. Slowly, through the centuries, man added to this list and also made his tools of better material—especially after he learned to obtain and use the metals. Nevertheless, down to the early part of the nineteenth century, man's agricultural tools were but little better than those used in Egypt thousands of years ago. Our colonists still used a wooden plow, with an old horseshoe or other bit of scrap iron nailed to the mold board. They still used rude harrows with wooden teeth, or even large branches of trees, to pulverize the soil. The great changes in tools and machines for cultivating the soil have all come about in a little over a hunded years.

In the 1790's Charles Newbold of New Jersey began to work out the idea of a cast-iron plow. His plow was ridiculed by the farmers of the time. They were sure an iron plow would poison the soil! But an iron plow would be so very useful that various persons kept working at the idea. The man who made it really practical was a Quaker named Jethro Wood. He made his plow of separate parts that could be replaced when broken, instead of having it cast all in one piece, like that of Newbold. Between 1830 and 1870 so many improvements were made in the plow that we may say we have had our modern plow since 1870.

Although the plow for turning the soil is the basis of all farming, it would have profited the farmers little if the rest of the work had continued to be done by the old methods. Men could not cultivate large areas, even when plowed, if they had only hoes and rakes or even wooden harrows drawn by oxen. There had to be better harrows and cultivators. Harrows with both body and teeth of iron were introduced, and by 1870, we had the modern toothed harrow with levers that could change the pitch or the slant of the teeth. Later the disk harrow, with disks or sharp wheels that cut up the soil, came into general use.

With all these aids in preparing the soil, there was need of speedier

[19] Adapted from an article by Hazel Kyrk in Marshall, *Readings in the Story of Human Progress*, pp. 77–86. By permission of The Macmillan Company, publishers (1926).

and less laborious methods of planting the seed, and of cultivating the soil around the growing plants. Fortunately, the manufacture of seeders and grain drills began as early as 1840. Successful corn planters were devised ten years later. To-day there are seeders that both plant and cover the grain. There are corn planters that drop the kernels at any intervals desired. There are many kinds of toothed plows or cultivators for working the soil around the plants. Even potato planting and cultivation may now be done by machinery.

For the harvesting of grain the old stone hand sickle (later made of bone or metal) goes back to neolithic times. The metal sickle and its later form, the scythe, continued to be the main harvesting tool until about 1800 when the cradle came into general use. This cradle was a scythe to which wooden fingers had been added for collecting and holding up the grain as it was cut, and placing it in swaths. The cradle enabled one man to do as much as three or four could do with sickles, but, even so, it took a whole day to reap about an acre and a half.

Credit for inventing a machine to reap grain is usually given to Cyrus McCormick. Many inventors, in this country and abroad, had worked on the idea for a generation. But it was McCormick who, in the 1830's and 1840's, proved that the idea was practical and set up a factory to supply our broad farms with modern harvesting machinery. Of course the harvester of to-day, which cuts the grain, ties it into bundles, and dumps these bundles into piles, is a tremendous improvement over McCormick's early machines. His first invention did not accomplish all this.

The threshing machine, too, came into use in this country by 1840. Before this time grain had been threshed with the wooden flail. Using a flail, a man could thresh from eight to sixteen bushels of wheat in one day. To-day the threshing machine cuts, threshes, cleans, sacks, and weighs the grain from our western lands, without human hands ever touching it.

The hay crop of this country is now handled almost entirely by machinery. First came the mowing machine to take the place of the hand scythe. Then other machines took the place of the rake and pitchfork. About the middle of the century there came into use a spring-tooth sulky rake by which a boy and a horse could do the work

of many men in raking the hay into heaps. Hay loaders and hay stackers, with the hay fork and carrier to stow the hay away in the barns, have completed the application of machinery to this branch of farm work.

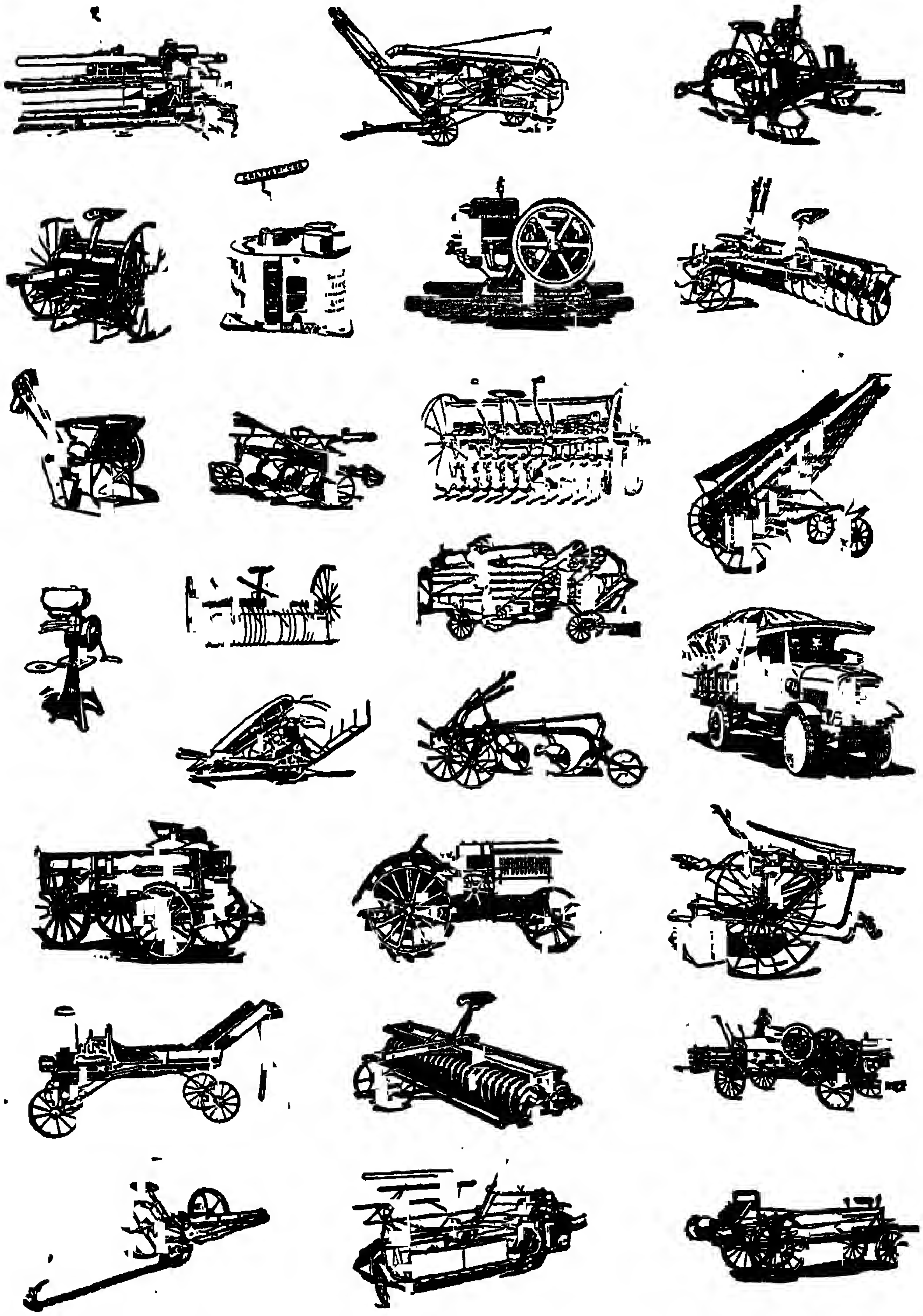
Long after the corn planter and cultivator had come into use, the stalks of corn were still being cut by hand. The old corn knife enabled a man to cut only one or two acres a day, and that with the hardest labor. The corn binder and shocker now cuts and binds from six to ten acres a day with the man sitting still and driving the machine. Formerly the ears were husked by hand with the aid of a husking peg. Now husking machines are in practical use, as well as combined huskers and shredders that husk the ears and shred the stalks into cattle food. There is also a corn sheller that will shell several hundred bushels a day. Farm machinery thus swiftly and easily takes care of the immense crops of corn—an accomplishment which seemed almost miraculous a few decades ago.

There are many other important kinds of farm machinery: potato diggers, hay balers, clover hullers, bean separators, and plant-setting machines of all kinds. The growing of rice, tobacco, cotton, and practically all other crops has been modernized by machinery.

Thus far little has been said about the power used to run this farm machinery. Until comparatively recently the only power aids that the farmer had were wind and animal power. Curious old windmills with great arms carrying sails were introduced from Europe by the early settlers. The modern type of windmill with a wheel instead of sails was developed in this country, and is still widely used. The services that such animals as the horse and ox have rendered man by adding their strength to his feeble efforts in drawing the plow, in carrying and hauling, can scarcely be over-estimated. The new plows, harrows, cultivators, planters, and harvesters were at first all horse-drawn. Gradually, however, steam and the other forms of modern power came into use, and probably the greatest changes in farming in the near future will be an even greater use of steam, gas, or electricity instead of the horse.

The steam engine was early applied to the work of threshing, and presently a steam tractor drew the thresher from farm to farm. Steam has also been applied to plowing on large prairie farms. But the steam

tractor is heavy and expensive, and the gasoline engine promises more for the future. The stationary gasoline engine has been set to work turning the milk separator, the churn, the ensilage cutter, the washing



Courtesy of International Harvester Company

SOME MACHINERY USED IN MODERN FARMING

machine, the sausage grinder, and the grindstone. It pumps water for the stock, for the house, and for irrigation. It saws wood, drills the well, digs post holes, and shells corn. By its power the barn and the orchards are sprayed, and the sheep are sheared. There seems no end to the service it can render the farmer and his wife. Besides the stationary engine and the one that can be mounted on a truck, there are now gasoline tractors. With the tractor the farmer plows, harrows, and plants—one man doing the work of many men and horses. The tractor will also reap and thresh the crop, and a motor truck will haul it to market. The farm is still far from a paradise of ease, but modern machinery has certainly freed the farmer from some of his drudgery. The farmer's task has become more and more one of guiding the horse or the tractor, and operating the machine.

The work of women on the farms has also been greatly lightened by machinery. The care of milk and the making of butter, for example, are not the hard tasks they formerly were. When much milking is to be done, the milking machine is used. A "separator" is installed in the dairy. The skimmed milk is fed to the hogs and calves and the cream is churned by power or sold to a creamery. Washing, canning, and cooking are made easier by labor-saving machinery and utensils. Best of all, the burden of the endless "fetching and carrying" has been greatly lightened by the introduction of new stoves and new fuels, and by the provision of an indoor water supply, which is pumped by a gas engine or a windmill.

Even the machinery used in city factories has lessened the farmer's toil. After great factories were built and began to turn out quantities of cheap goods of all kinds, the farm folk began to buy many things they had formerly made. The farmer ceased to make his tools. The farmers' wives and daughters began to clothe themselves in factory-made ginghams, worsteds, and silks. They bought ready-made garments of all varieties. And these city factories also gave the rural dwellers many new goods. The farmers furnished their parlors with rugs and pianos and victrolas. They set their tables with chinaware and silver; they equipped their kitchens in tin and enamel ware and aluminum. New foods appeared upon the table. The country dwellers came to use literally hundreds of goods they could not obtain until machines and factories made them cheap and plentiful.

The great improvements in communication and transportation have also made farm life very different from what it was. Since 1880 we have begun to be a nation with good roads. Fewer farmers are forced to stay at home several months of the year because the roads are impassable. Railroads are now so numerous that few farms in the central and eastern parts of the country are many miles from a station. The trolley lines also furnish convenient means for traveling and for shipping freight. But living as the American farmer does upon his own farm and not in villages, he would still be somewhat out of touch with his neighbors if it were not for the automobile. With it the farmer conveniently can make calls for business or pleasure throughout the countryside. To-day, too, many rural homes have a telephone, a radio, and daily mail delivery. Times are changed, indeed, since a generation ago, when weeks might pass and the farmer and his family see no faces and hear no voices except their own.

4. MODERN STORAGE

A. GENERAL STATEMENT[20]

Warehousing, originally a function of business carried on by merchants for themselves, has become in large part a specialized form of business activity carried on by separately organized business units. To the simple function of storage has been added other operations incidental to and supplementary to putting goods in storage. Principal among these operations are the financing of customers of the warehouse by means of loans extended on the security of warehouse receipts. Requiring that insurance be carried on stored commodities as further protection for those who lend money on warehouse receipts is an extension of the financing function.

It is not unusual for warehouses to sort, mix, pack, or recondition commodities stored therein. The weighing, sampling, inspection and grading of goods is facilitated by the warehouse. These services combined with the issuing of warehouse receipts make the warehouse indispensable to the conduct of trade on organized produce exchanges.

The warehouseman often acts as agent for either buyer or seller in the receipt or distribution of goods. In this capacity he honors orders for goods in storage drawn upon him by the owner, distributes

[20] Prepared by E. A. Duddy.

the goods to the owner's customers, makes collections, and accounts to the owner periodically as an agent in the employ of the owner company might do.

More recently the warehouseman's function as a forwarding agent has come to play a leading part in carrying on his business. Full carloads of merchandise are received by the warehouse at a distributing center like Chicago and are there broken up into "less carload lots" for individual buyers at widely scattered points without ever going into storage.

What was once an unspecialized function of business generally has come to be broken up into a number of well-differentiated types. Following are the principal types of warehousing now in operation in the United States: general merchandise, of which the bonded warehouse is a modified form; cold storage; household goods and furniture; the warehousing of cotton, grain, tobacco, wool; railroad and wharf storage, yard and ground storage, pig-iron storage, office-record storage, implement and vehicle storage.

The *general merchandise warehouse* receives, stores, and forwards all kinds of manufactured goods and many staple commodities such as flour, sugar, coffee, and canned goods. More than 1,500 different articles of commerce may be found stored in these warehouses. In June, 1928, according to the Department of Commerce, there were 1,124 such warehouses doing business in the United States with a total capacity of 76,970,000 square feet of floor space. Of this total, about 70 per cent. was used for public warehousing. About 65 per cent. of this space used for public warehousing is occupied on the average throughout the year. About 75 per cent. of the total tonnage of goods received actually goes into storage.

As might be supposed, most of this general merchandise warehouse space is located in the manufacturing states; approximately 30 per cent was in the Middle Atlantic states, and 20 per cent of the total was in the East North Central states in 1928. The other Atlantic Coast states and the Pacific Coast were next most important. New York, Chicago, Philadelphia, Boston, Minneapolis—St. Paul, and Los Angeles are the chief centers of merchandise storage. There are about 6.5 cubic feet of merchandise space per capita in the United States.

A *cold storage warehouse,* according to the United States Department of Agriculture, is any place artificially cooled to a temperature of 45° F. or below, in which food commodities are stored and held for thirty days or more. A public warehouse is one in which the goods stored are not owned or controlled by the operators of the warehouse, but which the warehouseman receives and stores for a consideration.

For the year 1927, the Department of Agriculture reported a total of 667,846,573 cubic feet of cold storage space in the United States. Of this total 41 per cent. was public storage space; 36.8 was private space in meat-packing establishments; 10 per cent in meat-packing plants but operated as public space; 8.5 per cent in combined public and private plants, and 3.7 per cent in private plants.

The principle of refrigeration has a very wide use in industry today, the *Ice and Refrigeration Blue Book* listing sixty-one businesses in which refrigeration is used with a total of more than 731 million cubic feet of refrigerated space.

Public cold storage space is concentrated in much the same areas as general merchandise space. The Middle Atlantic states had, in 1927, 33.6 per cent of the total; the East North Central states 22.8 per cent; the West North Central 10.3 per cent, and the Pacific Coast states 12.3 per cent. There are about 2.5 cubic feet of public cold storage space per capita in the United States.

Chicago leads all other cities in total cold storage space. Other important centers are New York, Kansas City, St. Louis, Omaha, Boston, Indianapolis, Philadelphia, Cleveland, Los Angeles.

The *storage of household goods and furniture* had its beginning in the city of New York during Civil War days, but it was not until 1870 that this type of warehousing was put upon a sound basis by the erection of buildings especially designed for the purpose. Now this type of warehouse has not only a special kind of construction, but rooms which are designed and equipped for the safe storage of pianos, works of art, furs, etc., where temperature, dust, and vermin control are essential.

No data are available on the amount of this kind of warehouse space in the country as a whole. An estimate in 1924 indicates that at that time 27 per cent of total commercial warehouse space was used for the storage of furniture and household goods. Most of this space

is found in the large cities where population is more mobile than in the country or small town. The growth of the industry has been coincident with the growth of large cities and cheap transportation.

The *storage of a staple commodity* may be illustrated by the case of grain. The grain elevator originated at Buffalo, New York, in 1843 in response to the need for a cheap method of handling bulk grain. By means of rapidly moving belts to which buckets are attached, great quantities of grain may be unloaded from freight cars and boats into and out of these elevators with the use of relatively little human labor.

Grain elevators are distinguished either as country, mill, or terminal elevators. Country elevators are located along the railroads in the grain-growing states and serve as points of first concentration. Terminal elevators are found in the large interior grain markets and at the ports. The mill elevator is the property of the flour or cereal mill and is used for the private storage of grain. In 1927 there was a total mill and terminal grain storage capacity in the United States of 405 million bushels. Approximately two-thirds of this was terminal elevator space. Half of this terminal elevator space was at interior markets, while the other half was distributed among the lake ports of the Great Lakes and on the Atlantic, Pacific, and Gulf coasts. The last official estimate of country elevator storage was that of the United States Grain Corporation in 1918. The corporation reported a total of 21,542 country elevators with a capacity of more than 521 million bushels. Ninety per cent of country elevator space was in states of surplus grain production.

The principal centers of grain storage in the United States are Chicago, Minneapolis, Buffalo, Duluth–Superior, Kansas City, Omaha, St. Louis, Baltimore, New York, Philadelphia, and New Orleans.

Within market centers, grain elevators are found in close relation to water and rail transportation; in fact, direct access to the transportation system is indispensable. Congestion in the rail terminals of large interior markets is forcing grain elevators and other bulk storage facilities to locate on the outer edge of the city.

Warehouses for the storage of cotton are located at concentration points and at the ports for export. Mills which fabricate the cotton also maintain their own private storage facilities. Storage at the concentration point is incidental to the process of reducing the bulky

loose bale which comes from the gin to the compressed, high density bale of commerce. It is only after the cotton has moved from the gin to the compress point that it is allowed to go into storage.

The storage of cotton not only safeguards it against damage by weather and fire, but it facilitates sampling and grading into commercial grades and making up lots for sale to domestic and foreign buyers. By using the warehouse, too, the owner of the cotton is able to borrow at the bank on warehouse receipts issued by the warehouse. He is thus able to hold his crop for a favorable market with a resulting stabilizing effect on cotton prices generally.

The Bureau of the Census in 1923 estimated that the Cotton Belt had approximately 20,000 gin-compress warehouses and more than 4,000 public cotton warehouses.

In the warehousing of tobacco, the conditioning, inspection, and sale of the product are inseparable from the warehousing. The warehouse is the market place for the sale of the crop to the tobacco buyer. Storage runs from one to three years with warehouse receipts issued up to a three-year limit.

The warehousing of wool is carried on chiefly at ports of import, Boston, Philadelphia, and San Francisco being the principal points. The wool warehouse not only performs a storage function, but here the fleeces are sorted and graded into commercial lots for sale to a buyer. The multiplicity of grades makes it difficult to issue receipts upon which loans may be negotiated as in the case of grain and cotton.

Further specialization in warehousing is evidenced by separate facilities for the storage of tea, coffee, sugar, oil, rice, and canned goods. Still other articles of commerce create peculiar hazards for the general merchandise warehouseman and he ordinarily refuses to store them. Among these are such highly inflammable fibers as broom corn, corn silk, flax, hemp, hay, etc. In this class also belong highly dangerous explosives. Oils and chemicals which may contaminate other commodities with their odors form still another class. Specialized types of warehouses in which only such commodities are stored arise to meet these various needs.

Besides the kinds of storage already described there are types of warehousing which are essentially a part of the transportation service. *Railroad and wharf storage* where goods are held in transit sheds for

short periods of time is an example of this type. Such storage is a necessary link in the transportation of goods from boat to rail or vice versa, or at terminal points where goods are awaiting delivery to the consignee.

Yard and ground storage applies to such commodities as sand, gravel, coal, ore, lumber, etc., which may be piled up out of doors with a minimum amount of damage to the commodity. The lot upon which such property is piled, if properly fenced, is a legally constituted warehouse.

B. COLD STORAGE[21]

The use of cold in preserving food stuffs has a long history. No one knows who discovered the idea of the use of cold as a preservative; it may well be that primitive man merely by chance found the preserved flesh of some animal frozen in its lair or caught in a snowdrift and so learned the connection between coolness and keeping foods from spoiling. Pits, caverns, and caves 20,000 years old have been found in north central Europe, which evidently were used as cold storage devices by prehistoric man.

Coming down to historic times we find considerable use of ice. In the Songs of Solomon we read of ice being used to cool both food and drink. Hippocrates, a Greek physician, in 460 B.C. feared for the results of cold food and drink on the human system. In India from ancient times it has been the custom to make ice by the quick evaporation of water by putting flat dishes filled one-half inch with water in a box twenty inches deep filled with straw; during dry nights part of the water evaporates and the rest freezes, being well insulated against the outer air. The Egyptians hastened the evaporation by waving palm branches over the water all night. Nero, in Rome, had ice houses built for storing the natural ice supply, which was used in the preservation of dainties and in cooling drinks. As early as the twelfth century the Chinese cooled water by a mixture of snow and saltpetre, a practice Europe learned about 1550. In 1607 an Italian found that by repeating the mixture of saltpetre with snow a liquid could be brought to a very low temperature, and he froze a glass of water by moving it in a mixture of ice or snow and saltpetre.

[21] Adapted from an unpublished manuscript by Dwight L. Palmer, *Some Social and Business Aspects of Storage.*

The end of the seventeenth century markes a change, in that ice was being more fully appreciated for its practical utility. The business of serving ice to the public began in France. It first came to respectable size in Great Britain and Germany, the ice being brought from Norway. The year 1799 marks America's entrance into the ice trade, for in that year ice was taken to the West Indies. Ice had been used by the colonists for food preservation earlier, as they either learned the practice from the Indians or from England. Natural ice production was further increased by the calls of the government for ice in the hospitals during the Civil War. By 1879 the trade reached its apex; over 1,300,000 tons of ice were harvested in Maine that year; and in 1880 there were 135 ice plants on the Hudson River between Albany and New York. After 1880 the natural ice trade fought a losing battle with mechanical refrigeration, and by 1890 it had sunk to negligible importance.

The first cold storage plant for fruit was built in 1856. It made use of natural ice mixed with salt and placed in galvanized iron tanks along the walls of the cold room. Nine years afterward an improved warehouse in New York made use of natural ice but a system of closed coils was used whereby the coolness of the ice was transferred to brine (salt water) and the latter circulated around the produce. This was not mussy, high humidity was avoided, and there was no opening of doors for reicing to let in heat. In 1869 the first carload of iced beef went from Chicago to New York. A ship brought eighty tons of Argentine beef to France in 1878. From that date on the exporting of American meats to Europe was a rapidly growing industry.

Lord Bacon in England was one of the first among scientific men to become interested in the use of cold, pointing out how valuable it would be if man had the same control over cold he already had over heat. Dr. William Cullen in 1755 invented a machine for producing cold by partial evaporation of water placed in a shallow dish in a vacuum. Joseph Priestley in 1774 extracted ammonia from compounds and called attention to its excessive solubility in water, thus foreshadowing its later use. Dr. Joseph Black (1728–99) proved that any change of substance from one state to another, such as from a liquid to a gas, involved a change in energy, of which heat and cold are examples.

The absorption system of using ammonia in refrigerating machines was invented in 1850. A vessel or boiler called the generator was filled with a strong solution of ammonia and was provided with a coil into which steam might be turned or water admitted, depending on whether the generator was to be heated or cooled. Upon heating the ammonia the expansion of the gas caused an increase in pressure which forced the gas through a valve to the condenser, where it was cooled by running water and condensed to a liquid. Then it was turned into a receiver and was allowed to flow into an evaporation coil, which produced the actual refrigeration. An ammonia absorption machine was exhibited at the Paris Exposition in 1867. This made six tons of ice a day. In 1853 Professor A. C. Twining invented his machine using ether as a refrigerant. In 1855 he produced 1,600 pounds of ice daily, which was distributed in Cleveland among householders and butchers.

A most important incentive to the development of cold storage was the growth of cities. More than half of the United States' 110,000,000 people are now city-dwellers, separated from the sources of food supply. In a non-refrigerated distribution system this would mean that only those foods would be found in urban stores which do not need cold storage to preserve them until they reach the consumer. The diet of city folk in respect to meat, berries, green vegetables, and milk would be very restricted; only the amounts produced by nearby farmers which could be gotten quickly to the consumer from farm, dairy, or slaughter house would be available. This would mean a poor selection, higher prices, and an absolute dearth of such foods during the seasons when they were not grown or produced.

Cold storage encourages production by giving a widened market —it renders the demand of a far-off city as alluring as the old local demand of one's neighbors; and the increase in physical proportions is tremendous, as witness the growth of total population and of urban development. The results of mechanical refrigeration upon the raising of fruit has been important and extensive. The old system under which a farmer merely raised a small amount of a variety of fruits for family and local use has been changed. By mechanical refrigeration great areas of orchard land have been planted to a single crop such as apples. This specialization of a large producing area has had

important results in changing old processes and methods. The varieties of fruits planted are carefully studied and selected with a view to market demand. The picking is done by trained workers to eliminate injury to the fruit. The grading is done by experts and packing and shipping are arts in themselves. All of these changes have resulted in benefits both to the producer in increasing his income and to the consuming public in giving them high quality, standard products the year around.

Refrigeration thus makes possible the development on a commercial scale of activities which previously were carried on in a haphazard manner with the attendant high cost per unit which goes with dealing merely with the local demand. Refrigeration fits itself into the marketing scheme of the products it protects in a full and effective way. On the farms are established small storehouses, which hold the produce from time of picking until shipment date and also serve as precooling plants. Refrigerator cars move the fruit to the market. In the central markets and in the large port cities cold storage houses are ready to hold the goods until the market will demand them.

Year	Space Cubic Feet
1904	102,500,000
1909	160,100,000
1911	169,541,000
1914	200,000,000
1917	237,000,000
1921	266,000,000
1923	297,800,000
1925 (est.)	400,000,000

Increase of Public Cold Storage Space in the United States

The cold-storage industry has aided especially the perishable products of an outstanding seasonal character. Eggs are a type of these, although there are many others—butter, cheese, tomatoes, potatoes, etc. Fifty per cent of the country's eggs are produced between March and June. Before cold storage was possible this meant that the farmer had to sell eggs to the local consumers and was forced to throw the heavy spring production suddenly on the market, thus depressing prices greatly. The result was that egg-producing was unsatisfactory to the farmer and that the city-dwellers had to go without eggs part of the year or else pay excessive prices for them. Refrigeration allows the producer to store his surplus during the spring months, giving him

a chance to market the product throughout the year, and the city consumer is assured of eggs the year round. Today the cold storage houses handle 86 per cent of the egg production. The months of heaviest storage are March, April, and May. The incidental results of refrigeration are great. It does not pay to store an egg unless it is in "A1" condition. This has led to some reorganization of the egg-producing industry. Hens are now scientifically selected and bred. Their food is carefully chosen with a view to maximum egg production. Clean nests are provided. The eggs are gathered often and are sent quickly to the local warehouses. Candling (inspection against a light) eliminates the unfit. Standard grades have been evolved and set. To the farmer it has meant the necessity for better methods and this led to a standard high-grade product. To the consumer refrigeration of the egg industry meant an available egg supply twelve months a year, product of much higher quality, and a uniformity of prices that was impossible earlier.

5. THE BOOK A TYPE OF COMMUNICATING CAPITAL GOODS[22]

The book of the twentieth century requires the following: thoughts of the writer; language in which he may express his thoughts; alphabetic symbols in which he may express his language in writing or printing; paper; the book form of bound sheets; printing ink; mechanical process for printing; mechanical process for making the alphabet in metal so that it may be used for printing (types); mechanical process for arranging the letters in the correct order for printing; mechanical processes for binding; mechanical power to motivate these machines; demand sufficiently large and constant to warrant large-scale production.

To give definiteness to the time conception in the development of the technique of the book down through the ages, let us imagine ourselves marking off the centuries on the face of an imaginary clock which is divided into the usual twelve-hour intervals, each hour representing five hundred years. For the purposes of this history clock we shall assume that the book was first made at a time represented by the figure twelve on the dial. For example, in Egypt and in Mesopo-

[22] Prepared by Louella Arnold Kaufman.

tamia writings which may be called books were being made on leaves, stones, ivory, crudely prepared skins, and other surfaces.

The hour hand on the imaginary dial turns. As it reaches one, it represents time about five thousand five hundred years ago. At that time, in a few of the more favored spots on the world-surface, man had learned to make fairly satisfactory books which were somewhat modern in appearance. Probably the kind of book most nearly modern in appearance at that time was the Egyptian papyrus roll. Papyrus *resembled paper;* it was more nearly like modern paper than any other material of the older cultures. Like paper, papyrus was more portable than rocks or stones; it was more durable than leaves.

The hour hand on the dial turns to two, three, four, five, six, and seven. That time represents more than half of man's book-making career. There was no significant change in the technique of the book up to the time represented by half past seven on the dial. Slightly before eight o'clock on the imaginary dial the book-making technique in the Museum of Alexandria—that famous university in northern Egypt—is reached. The Alexandrian book was still the rolled papyrus; it was still written laboriously by hand.

At about the beginning of the Christian era—four hours ago on the imaginary clock—the center of the book trade and of book production swung over to Rome from Alexandria. In Rome, as in earlier centers of book production, book-making was simple. In essence, it consisted of writing the books through one by one as they had been written since the beginning of book-making. Although parchment was known, papyrus was still by far the most common writing surface. The old roll form was still paramount but a new book form was slowly coming into usage at that time. This new *form* was made up *of bound sheets*—the same form as that used in the twentieth century, A.D. The Romans called this book of bound sheets the "codex" as distinguished from the volume (the roll). The codex form of the book was made possible, in a large measure, by the increasing availability of parchment. Parchment was much stronger than papyrus—strong enough to stand without tearing the piercing that was necessary to bind the sheets together. Further, the improvement in the preparation of the skins which made it possible to write on both sides (this had not been the case with papyrus) facilitated the transfer to the new book form.

Let us return again to the dial of our imaginary clock. As the hour hand passes to nine—only three hours ago—and on to ten and a little beyond, it is passing over that period known as the Dark Ages. During this time the technique of the hand-written book was brought to a high state of perfection, if sole reference is made to the beauty of the book. The book was a work of art but was so expensive that it meant nothing to the huge majority—to all but a very few, in fact—of the population of Europe. In the main, books were made for and by monks and nuns in isolated monastic institutions.

Within the last hour, as measured on the imaginary clock, man has made such radical changes in the technology of his book that it is now largely a product of the machine. Within these last five hundred years he has learned to make and arrange his letters, make his paper, print and bind his books by machines motivated by mechanical power. The first radical change in his methods of book production came when he substituted printing on a hand-operated press for handwriting. This occurred in the middle of the fifteenth century.

The invention in the middle of the fifteenth century is often spoken of as the "invention of printing" but it is, more accurately, the "invention of typography." "Typography," which means printing from movable type, is not synonymous with "printing" for the latter includes, in addition to typography, such as these: xylography (printing from solid wooden blocks), lithography (printing from smooth surfaces), and copper-plate printing. Typography involves the emergence of the idea of printing from movable type and its application in a practical mechanism. Even in its simplest form, as used in the fifteenth century, typography could not be used satisfactorily and extensively until man had learned that he could print from units; until he had learned to make these letter units (types) from metal so that they would be durable and accurate; until he had an ink that was glutinous so that it would press into the printing material (parchment or paper) without leaving blotches, and until he had an adequate and inexpensive supply of material on which to print. This last means that typography was dependent upon the technology of paper-making.

The essential characteristic of paper-making is the netting together of pulped vegetable fibers. Whether they are made from bamboo, the mulberry, or other tree, from cotton, flax, or any of the

numerous other vegetable sources, the fibers are pulped into a soft mass of tiny bits. Those little portions of fibers are then felted together to form sheets of paper.

After having been invented in eastern China in about 105 A.D. the secret of paper manufacture worked to the West very slowly. In 751 A.D. paper-making entered the Arabian world and started on its journey to Spain and thence to Christendom. During the year 751 two Turkish chieftains were engaged in war. One hired the aid of the Chinese and the other was assisted by a band of Arabs. The Arabs were victorious. They took many prisoners, among them several Chinese paper-makers. These Oriental paper-makers taught their conquerors, the Arabs, the secret of paper manufacture according to the process which had been invented in China in the second century. Paper soon became the common writing material among the Arabians. It was natural that the Arabians would carry their paper-making to their cities in northern Africa and also to their settlements in Spain. The year 1150 marked the entrance of paper-making into Europe by means of this transmission of the secret of its manufacture by the Arabs as they extended from the Near East toward the West and into Spain. In the meantime, paper had entered Europe as an article of commerce from the cities of the Near East, particularly from Damascus, entering through Constantinople. Paper also entered Europe through Sicily from the cities in northern Africa. Up to this time paper was entirely in the hands of the Saracens. But in 1189 the first Christian paper mill was established at Hernault in France; the first Italian mill—also in Christian territory—was running in 1276. After this time Christendom took the lead in paper manufacture.

The pressure required to print is furnished by a machine called a *press*. Presses were not new to Europeans in the middle of the fifteenth century for Europe already had a device, which in essentials was like the printing press, that had been used very commonly for pressing cheese and making wine from grapes. These old wine and cheese presses, from which the printing presses were adapted, were very simple. They were entirely of wood, consisting of a framework which supported two flat horizontal surfaces parallel to each other. These surfaces could be brought into contact by the action of a screw

working through a nut. The power was transmitted into the machine by a bar working in the nut. The operation was by hand.

These little presses, which were operated with so much difficulty, printed slowly. It is said that Gutenberg's shackly wooden press could make twenty impressions in an hour. Although there can be no comparable figures by which the rate of output in hand-written books might be compared with those of the hand-operated presses, it is probable that even this crude little press that made only twenty impressions in an hour could work faster than books could be written by hand. But in comparison to the presses of the twentieth century the early hand operated presses were snail-like in their operation. With the modern printing press of sheet capacity of 2,600 in an hour (1,300 on both sides) the rate of output of the modern press, if 32 pages are printed on one bed, is two thousand times as great as that of the press of the early typographers. As a matter of fact, this huge difference between the possible output of the old and the new book presses is conservative. Some of the early presses—perhaps the majority—printed only one page at a time.

Let us return to the imaginary clock on which we have measured the passing time in the developing technique of the book. On that clock we have seen that Western man had hand-written books for eleven of the twelve hours in his book-making career. One hour ago he learned to print his books in a hand-operated machine. Before the modern, abundantly-produced book could be made the following were necessary: mechanical process in paper-making; better mechanical process for printing; mechanical process for making the alphabet in metal; mechanical process for arranging the letters in the correct order for printing; mechanical processes for binding; mechanical power to motivate these machines; demand sufficiently large and constant to warrant large-scale production.

Before the opening of the nineteenth century pulp had been beaten in Europe in a crude machine. During the sixteenth century the beating had been accomplished by a device which consisted of a wooden cylinder evenly spiked with projections. The cylinder was revolved by force generated by a water wheel or windmill. The projections on the cylinder revolved and then heavy wooden stampers were dropped. These stampers beat against the torn rags that were within the tank.

This crude device accomplished exactly the same thing as the Oriental paper-maker as he beat his pulp and then mixed it with water with his hands. About 1750 the Hollander beater was invented to perform much the same function. In essence, the Hollander, which is still in use as improved and enlarged, is a tub with rounding ends in which revolving knives are so arranged that they may macerate the raw material into pulp rapidly. This machine, motivated by mechanical power, enormously increased productivity in the paper industry.

The sheet-making machine developed later. Up to the first of the nineteenth century every sheet of paper in the world had been made sheet by sheet by hand on a sieve in a manner essentially the same as that used in the Oriental paper-maker's shop. In 1798—only two years before the iron printing press was invented—Louis Robert, a Frenchman, patented an invention for making paper sheets in an endless web. Fourdenier and his assistants improved the machine, putting it into practical operation in 1803. The sheet-making machine, which still bears the name of Fourdenier, is so constructed at the present time that pulp flows in at one end of the machine, passes over an endless wire cloth and over several steam-heated rollers, and emerges at the opposite end of the machine in a dry continuous sheet of paper. The machines vary in size and capacity, but it is interesting to know that one of the largest Fourdenier machines in the twentieth century can make paper 180 inches wide and run at a speed of 650 feet a minute. This machine produces 76,000 pounds of paper in twenty-four hours. This is in startling contrast to the meager output of the hand workman.

After books were first printed typographically, the technique of printing almost marked time for three hundred and fifty years—for more than forty minutes on the imaginary clock. In groping for some manner of increasing the output from the press so that books and newspapers might be supplied more abundantly after 1750, it is obvious that the printers would attempt, also, to use some of the kinds of non-human power which were being applied in other forms of industry. Contemporary writers mention the use of water power, horse-power, and the steam engine (after its invention in 1782) in connection with the ordinary wooden press as it existed before 1800 (much like the wooden press of 1450) but, although these power forces could

apparently drive the printing machine, results were not sufficiently satisfactory to justify their general adoption.

While some persons were experimenting trying to make the platen on the old wooden machine larger and while others were applying water power, horsepower, and the steam engine to this old platen press in the vain attempt to satisfy book wants more abundantly, William Nicholson, of London, was dreaming of a very different kind of printing machine. All printing machines previously had used flat surfaces in impression-making. Nicholson took out a patent in England in 1790 for a machine in which he substituted cylinders for flat surfaces. Nicholson's prophetic patent did not stop with the cylinder press, for his patent covered a principle in printing mechanism which involved the use of two cylinders, one for the impression-making and the other to hold the type. Both cylinders, upper and lower, rotated and between their curved surfaces as they came into contact the printing impression was made on paper. This idea contains the fundamental principles upon which rotary presses—our newspaper and periodical presses—are built today.

While the press-makers were attempting to invent a better platen machine to be operated by hand power, Koenig, a Saxon who worked in England, was trying to apply steam power to the platen press. But sometime before 1810 Koenig gave up the idea of motivating a platen press by steam and became converted to the cylinder principle which Nicholson had foreseen in his patent of 1790. Koenig patented a *steam-driven cylinder press* in 1811 and thereby made the most significant improvement in printing technique since the invention of typography in 1450. The steam press could make 1,100 impressions an hour, while the best platen press of the time could print only 300 impressions in an hour.

Although typesetting machines were known as early as 1822, the first machine to be generally adopted for arranging type was the linotype, which has come into usage within the last fifty years. The first patent on the linotype was taken out in 1875, but as late as 1893 compositors were still debating whether or not typesetting machines would prove ultimately successful in their field. Another machine for typesetting which is preferred by many book-makers is the monotype which casts and sets individual types. The monotype was first ex-

hibited at the World's Fair in 1893. Monotypes have revolutionized modern book composition for even the best work can be set on this ingenious machine. It is not too much to say that the modern book of good quality could not be produced as abundantly and cheaply if it were not for the monotype. The revolution in composition has thus been accomplished within the last six minutes on our imaginary book clock.

The revolution in binding has been as recent in its successful culmination as that in composition. Early attempts were made in binding machinery but, probably due to the variety of processes involved as well as to the intricacy of the binding operations, the revolution—the application of the power machine—was delayed. Two of the most significant book-binding machines of the present (and there are many) are the case-making and the casing-in mechanisms. A practical case-making machine was put on the market in 1896—only thirty years ago. This machine assembles cloth for covering, board (pasteboard for the covers), back lining, and glue, turning out completed cases at the rate of from five hundred to seven hundred and fifty an hour. Another machine adapted to huge editions will make one thousand cases in an hour. The casing-in machine, which has come also within the last thirty years, is one of the most revolutionary binding mechanisms. By its use, the binder attaches the case, which is already made, to the sewed book. This machine averages five hundred books an hour. These two processes, in their speeding up by mechanization are typical of most other operations in book-binding.

The revolutionary developments in the fields of composition and binding since about the year 1880 have not been the only changes in the technology of the book. In addition, the chemist has given the printer a variety of ink; illustration processes based upon photography—zinc etchings and halftones—are a vast improvement upon the old xylographical block prints; electrotypes and stereotypes have been brought to a high state of perfection. Further, *electrical power* has come to furnish a large share of the motivating energy required in book-making. The industry has become almost totally mechanized within this last six minutes on the imaginary book clock.

The *Publishers' Weekly* gives the following estimate of the number of books published from 1450 to 1908:

Periods	Books Published	
1450–1500	30,742	
1500–1600	285,824	
1600–1700	972,300	
1700–1800	1,637,196	
1800–1900	6,100,527	
1900–1908	1,395,552	
Total 1450–1908		10,422,141

These figures, as far as is known, refer to number of titles published not to total number of copies. If the total number of copies were available, obviously total book production portrayed would be vastly larger.

See also "The Newness of Present-Day Living," page 248.

C. Some Consequences of the New Technology

Thus far in our discussion of the physical equipment of civilization we have been concerned with getting a reasonably clear idea of the classes of capital goods which we use; with reaching an understanding of *why* the chemical, the bacteriological, and especially the mechanical technology is so useful in production; and with seeing our capital goods—especially our active capital goods—at work in a few typical industries. It now remains to deal with certain general considerations with respect to the creation and utilization of capital goods. We shall again draw our illustrations and problems mainly from the mechanical field.

It is obvious that capital goods are physical things. It is equally obvious that capital goods do not rain down from heaven; they are the result of effort. It "costs something" to make them. If our available stock of social energy is thought of as being made up of natural resources, labor, capital goods, and organization, it is clear that some of this social energy is absorbed every time a *new* capital good is made. The same remark may be made of every repair or improvement or replacement of an existing capital good.

Although the use of capital goods greatly increases the amount of consumers' satisfactions ultimately available, their use is not all clear gain. Among the more significant subtractions which must be kept in

mind are the costs of producing and maintaining the capital goods, the irksomeness of waiting, the cost of inventing and experimenting, and the costs of scrapping old forms of capital goods when better forms have been invented.

Thus far our discussion of capital goods has been in terms of an increased output of consumers' goods. But capital goods do more than increase output. They react upon the character of the work that is performed and thus cause man to perform his activities in a new régime. This is readily appreciated when we view the matter historically. It is easy to see, for example, that the coming in of certain types of capital goods (such as the electric magnet or the steam crane) greatly relieved man from the drudgery of hard lifting and dull carrying. Other types of capital goods, such as the automatic machine, are really manifestations of a transfer of thought, skill, and intelligence from the former skilled worker to the machine, with resultant effects upon the worker's technique of production, his bargaining position, and his whole mental outlook.

So great has been the effect of the machine upon our technique of production, and indeed upon our whole social organization, that some writers raise the question whether the machine today is the master, and man the slave.

The following selections have been pointed toward these issues:[22a]

1. In what respects has the power-driven machine meant new situations for the worker?
2. In what respects have the exigencies of the machine process led to standardization? To a more varied life?
3. Upon what does it really depend whether the power-driven machine (that is to say, modern technology) is to be our master or our servant?

1. THE TRANSFER OF THOUGHT, SKILL, AND INTELLIGENCE[23]

Suppose it be desired to drill four holes in a number of plates, so that they bear a certain fixed relation to the edges of the plate; and suppose the operator to be equipped with the ordinary drilling ma-

[22a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 112–18. (University of Chicago Press.)

[23] Adapted by permission from D. S. Kimball, *Principles of Industrial Organization*, pp. 10–13. (McGraw-Hill Book Co., Inc., 1913.)

chine which guides the drill so that it pierces the plate squarely. To drill these holes in *one* plate, with any degree of accuracy, requires a high degree of skill on the part of the operator; and to drill any number of such plates so that the spacing of the holes in them will correspond closely with those in the first plate requires a very high degree of manual skill, considerable time per plate, and is a very costly operation.

Suppose, however, a skilled workman makes a so-called "drilling jig" in which the plate can be securely clamped by set screws and in which all the plates can in turn be clamped in exactly the same position. The plate contains four holes, which have been very carefully located to correspond with the required location of the holes.

Now it is evident that almost any *unskilled* person can drill the plate, when so held, as accurately as the most skilled workman can without it. Further, he cannot drill the plate *inaccurately*. True, he must have a slight amount of training in handling the drilling machine, but this is small and soon acquired. *The accuracy of the work no longer depends on the skill of the operator but on the accuracy of his tools.*

This principle, illustrated above, has been aptly called "The Transfer of Skill," and it is to be especially noted that this principle has nothing to do with division of labor, though, as can be seen, it allows an extension of the same. Nor is the principle inherently applicable to *machines* alone; it can be and is applied to hand methods. True, most machines are constructed with this end in view, the drilling machine mentioned above, for instance, having this characteristic in so far as guiding the drill vertically is concerned.

It is evident that for a given operation the more skill that is transferred to the machine the less is required in the operator. When nearly all the skill has been so transferred, but the machine still requires an attendant, it is called a *semi-automatic machine*. Turret lathes are excellent examples of this class of machinery.

In drilling the plate without the jig the skilled mechanic must expend *thought* as well as skill in properly locating the holes. The unskilled operator need expend no thought regarding the location of the holes. That part of the mental labor has been done once for all by the toolmaker. It appears, therefore, that a *transfer of thought* or *intelligence* can also be made from a person to a machine. If the

quantity of parts to be made is sufficiently large to justify the expenditure, it is possible to make machines to which all the required skill and thought have been transferred and the machine does not require even an attendant. Such machines are known as *full automatic machines*. Automatic screw machines are excellent examples of a complete transfer of skill and thought. Care should be taken to distinguish clearly between *transmission* of intelligence, as illustrated in drawings, specifications, and written or spoken communications in general, between *men* and the transfer of intelligence or thought from a skilled man to a *machine*. These principles, transfer of skill and transfer of thought, lie at the bottom of modern industrial methods. Under former and simpler methods of manufacture the machine was an aid to the worker's skill, the amount of skill that had been transferred being very small. In the new machines the transfer of skill and thought may be so great that little or none of these are required of the attendant worker.

[NOTE.—The foregoing illustrates a principle. The application of this principle in the increasing use of automatic machinery is of wide extent and tremendous social significance. It should be noticed, too, that there is occurring a transfer of thought, skill, and intelligence to management. Scientific management is a phase of this movement.]

See also:
"Industrial Standardization," page 791.
"The Beginnings of Scientific Management," page 795.
"Principles and Devices of Scientific Management," page 800.
"Impersonal Laws of Management," page 803.

2. STANDARDIZATION AND THE MACHINE PROCESS[24]

The modern industrial communities show an unprecedented uniformity and precise equivalence in legally adopted weights and measures. Something of this kind would be brought about by the needs of commerce, even without the urgency given to the movement for uni-

[24] Adapted by permission from Thorstein Veblen, *The Theory of Business Enterprise*, pp. 8–14. (Charles Scribner's Sons, 1912.)

formity by the requirements of the machine industry. But within the industrial field the movement for standardization has outrun the urging of commercial needs, and has penetrated every corner of the mechanical industries.

As a matter of course, tools and the various structural materials used are made of standard sizes, shapes, and gauges. When the dimensions, in fractions of an inch or in millimetres, and the weight, in fractions of a pound or in grammes, are given, the expert foreman or workman, confidently and without reflection, infers the rest of what need be known of the uses to which any given item that passes under his hand may be turned.

The materials and moving forces of industry are undergoing a like reduction to staple kinds, styles, grades, and gauges. Even such forces as would seem at first sight not to lend themselves to standardization, either in their production or their use, are subjected to uniform scales of measurement; as, e.g., water-power, steam, electricity, and human labor. The latter is perhaps the least amenable to standardization, but, for all that, it is bargained for, delivered, and turned to account on schedules of time, speed, and intensity which are continually sought to be reduced to a more precise measurement and a more sweeping uniformity.

The like is true of the finished products. Modern consumers in great part supply their wants with commodities that conform to certain staple specifications of size, weight, and grade. The consumer (that is to say, the vulgar consumer) furnishes his house, his table, and his person with supplies of standard weight and measure, and he can to an appreciable degree specify his needs and his consumption in the notation of the standard gauge.

From this mechanical standardization of consumable goods it follows, on the one hand, that the demand for goods settles upon certain defined lines of production which handle certain materials of definite grade, in certain, somewhat invariable, forms and proportions; which leads to well-defined methods and measurements in the processes of production. Besides this, the standardization of goods means that the interdependence of industrial processes is reduced to more definite terms than before the mechanical standardization came

to its present degree of elaborateness and rigor. The margin of admissible variation in time, place, form, and amount is narrowed. Materials, to answer the needs of standardized industry, must be drawn from certain standard sources at a definite rate of supply.

Machine production leads to a standardization of services as well as of goods. So, for instance, the modern means of communication and the system into which these means are organized are also of the nature of a mechanical process, and in this mechanical process of service and intercourse the life of all civilized men is more or less intimately involved. To make effective use of the modern system of communication in any or all of its ramifications (streets, railways, steamship lines, telephone, telegraph, postal service, etc.) men are required to adapt their needs and their motions to the exigencies of the process whereby this civilized method of intercourse is carried into effect. The service is standardized, and therefore the use of it is standardized also. Schedules of time, place and circumstances rule throughout. The scheme of everyday life must be arranged with a strict regard to the exigencies of the process whereby this range of human needs is served, if full advantage is to be taken of this system of intercourse, which means that, in so far, one's plans and projects must be conceived and worked out in terms of those standard units which the system imposes.

For the population of the towns and cities, at least, much the same rule holds true of the distribution of consumable goods. So, also, amusements and diversions, much of the current amenities of life, are organized into a more or less sweeping process to which those who would benefit by the advantages offered must adapt their schedules of wants and the disposition of their time and effort. The frequency, duration, intensity, grade, and sequence are not, in the main, matters for the free discretion of the individuals who participate.

See also:
"Some Significant Standards, Their Meanings and Purposes," page 365.
"Industrial Standardization," page 791.

3. THE NEW STRAIN IN INDUSTRY[25]

What are the special forms of overstrain found in modern industry viewing industrial conditions, as was our premise, from the physiological point of view? In a brief sketch of this vast field it will be possible to single out only a very few features for comment. We can do no more than glance, as it were, at some of the innumerable processes which directly or indirectly feed the machinery of the world, supplying man's needs and luxuries.

Of those elements in industry which are most characteristic and which make the greatest demands on human energies, we may select the following: speed and complexity, monotony, piece-work, and overtime. Other fatiguing influences in machine work, such as noise and the mechanical rhythms, will of necessity come within the scope of our brief analysis, as well as the now recognized relation between fatigue and the incidence of industrial accidents.

The fatiguing effect of the roar of machinery is chiefly due to its influence upon the faculty of attention. Mental fatigue is "characterized pre-eminently by a weakening of the powers of attention." Voluntary attention is essentially a selective process, a "focalization and concentration of consciousness" upon one thing or a few from among the multiplicities, physical and mental, in whose midst we live. There is thus in attention a sensation of effort, and fatigue of attention is in direct proportion to the continuance of the efforts and the difficulty of sustaining them. Now, under the influence of loud noise, attention is distracted and the difficulty of sustaining it increased.

Thus noise not only distracts attention but necessitates a greater exertion of intensity or conscious application, thereby hastening the onset of fatigue of the attention. A quite uncounted strain upon this easily fatigued faculty results among industrial workers, such as girl machine operators, when the deafening intermittent roar of highly speeded machinery adds its quota to the tax of a long day's work. The roar is not even continuous enough to sink into monotony. With each stoppage and starting of a machine, it bursts out irregularly.

The subject of noise in industrial establishments is usually dismissed with the remark that the workers "get used to it," and doubt-

[25] Adapted by permission from Josephine Goldmark, *Fatigue and Efficiency, passim.* (Charities Publication Committee, 1912.)

less, in many occupations, the workers themselves are scarcely, or not at all, conscious of any increased application on their part due to the noise. But, in the main, the process of getting used to it involves precisely that increased intensity of nervous effort, that "feeling of being coerced," of which Wundt speaks in the laboratory experiments, and which, as we have seen, is most favorable for the approach of exhaustion.

The strain of machine work upon the faculty of attention thus leads to the gravest consequences. Another subtly fatiguing element in machine work, which we have not yet examined, is due to its rhythm. It is apparent that the rhythm of any power-driven machinery is fixed and mechanical, depending upon its construction and its rate of speed. Now it is true also that human beings tend to work rhythmically, and when the individual's natural swing or rhythmic tendency must be wholly subordinated to the machine's more rapid mechanical rhythm, fatigue is likely to ensue.

The increase of diseases of the nervous system among working people in the last decade is a fact that is now firmly established by extensive and a carefully conducted statistical inquiry. Whatever different causes of neurasthenia may be brought forward by different authors since Beard depicted its general features, there is one point on which all are agreed; namely, that the modern organization of industry with all its factors and sequels is a most prolific source of neurasthenia.

Intemperance, debauchery, and improvidence are the chief blemishes on the character of the factory work people, and those evils may easily be traced to habits formed under the present system, and springing from it almost inevitably. On all sides it is admitted that indigestion, hypochondriasis, and languor affect this class of the population very widely. After twelve hours of monotonous labor and confinement, it is but too natural to seek for stimulants of one kind or another; but when we superadd the morbid states above alluded to, the transition to spirits is rapid and perpetual.

See also "Strain and Monotony," page 841.

4. THE MACHINE AND THE LABORER[28]

In considering the influence of machinery upon the quality of labor, i.e., skill, duration, intensity, etc., we have first to meet two questions: What are the qualities in which machinery surpasses human labor? What are the kinds of work in which machinery displaces men? Now, since the whole of industrial work consists in moving matter, the advantage of machinery must consist in the production and disposition of motive power. The general economies of machinery are two: (1) the increased quantity of motive force it can apply to industry; (2) greater exactitude in the regular application of motive force (*a*) in time—the exact repetition of the same acts at regulated intervals or greater evenness in continuity; (*b*) in place—exact repetition of the same movements in space. All the advantages imputed to machinery in the economy of human time, the utilization of waste material, the display of concentrated force, or the delicacy of manipulation are derivable from these two general economies. Hence it follows that wherever the efficiency of labor-power depends chiefly upon the output of muscular force in motive power, or precision in the regulation of muscular force, machinery will tend to displace human labor. Assuming, therefore, that displaced labor finds other employment, it will be transferred to work where machinery has not the same advantage over human labor, that is to say, to work where the muscular strain or the need for regularity of movement is less. At first sight it will thus seem to follow that every displacement of labor by machinery will bring an elevation in the quality of labor, that is, will increase the proportion of labor in employments which tax the muscles less and are less monotonous.

One direct result of the application of an increased proportion of labor-power to the kinds of work which are less "muscular" and less "automatic" in character, will be a tendency toward greater division of labor and more specialization in these employments Thus the routine or automatic character which constituted the monotony of the work in which machinery displaced these workers will now be imparted to the higher grades of labor in which they are employed, and these in their turn will be advanced towards a condition which will render them open to a new invasion of machinery.

[28] Adapted by permission from J. A. Hobson, "The Influence of Machinery," *Political Science Quarterly,* VIII (1893), 111–23.

Nor is it shown that the introduction of machine production tends to diminish the physical strain upon the worker. As regards those workers who pass from ordinary manual work to the tending of machinery, there is a great deal of evidence to show that their new work taxes their physical vigor quite as severely as the old work. When any muscular or physical effort is required, it is pretty evident that an increased duration or a greater continuity in the slighter effort may tax the body quite as severely as the less frequent application of a much greater bodily force. There can be no question that in a competitive industrial society there exists a tendency to compensate for any saving of muscular or other physical effort afforded by the intervention of machinery, in two ways: first, by "forcing the pace"—compelling the worker to tend more and more machines, and to increase the strain, if not upon the muscles, then upon the nerves; secondly, by extending the hours of labor.

Now to come to the question of "monotony." Is the net tendency of machinery to make labor more or less monotonous, to educate the worker or to brutalize him? Does labor become more intellectual under the machine? Professor Alfred Marshall, who has thoughtfully discussed this question, inclines upon the whole in favor of machinery. It takes away manual skill, but it substitutes higher or more intellectual forms. "The more delicate the machine's power, the greater is the judgment and carefulness which is called for from those who see after it." Since machinery is daily becoming more and more delicate, the tending of machinery is becoming more and more intellectual. The judgment of Mr. Cooke Taylor in the conclusion of his admirable work, *The Modern Factory System,* is the same.

The question of the net intellectual effects of machinery is not one which admits of positive answer. It would be open to one to admit with Mr. Taylor that the operatives were growing more intellectual and that their contact with machinery exercises certain educative influences, but to deny that the direct results of machinery upon the workers were favorable to a wide cultivation of intellectual powers, as compared with various forms of freer and less specialized manual labor. The intellectualization of the town operatives (assuming the process to be taking place) may be attributable to the thousand and one other influences of town life rather than to machinery, save indi-

rectly so far as the modern industrial center is itself the creation of machinery. It is not, I think, possible at present to offer any clear or definite judgment. But the following distinctions seem to have some weight in forming our opinion.

1. The growth of machinery has acted as an enormous stimulus to the study of natural laws. A larger and larger proportion of human effort is absorbed in processes of invention, in the manipulation of commerce on an increasing scale of magnitude and complexity, and in such management of machinery and men as requires and educates high intellectual faculties of observation, judgment, and speculative imagination. Of that portion of workers who may be said, within limits, to control machinery, there can be no question that the total effect of machinery has been highly educative. Some measure of these educative influences descends even to the "hand" who tends some minute portion of machinery.

2. So also allowance should be made for the skilled work of making and repairing machinery. The engineer's shop is becoming every year a more and more important factor in the equipment of a factory or mill. But though "breakdowns" are essentially erratic and must always afford scope for ingenuity in their repair, even in the engineer's shop there is the same tendency for machinery to undertake all work of repair which can be brought under routine.

3. Finally it should be borne in mind that in several large industries where machinery fills a prominent place the bulk of the labor is not directly governed by the machine. This fact has already received attention in relation to railway workers. The character of the machine certainly impresses itself upon these in different degrees, but in most cases there is a large amount of detailed freedom of action and scope for individual skill and activity.

4. Making allowance, then, for the intelligence and skill used in the invention, application, management, and repair of machinery, what are we to say of the labor of him who, under the minute subdivision enforced by machinery, is obliged to spend his working life in tending some small portion of a single machine, the whole work of which is to push some single commodity a single step along the journey from raw material to consumptive good?

His work, it is urged, calls for "judgment and carefulness." So did

his work in manual labor before the machine took it over. His "judgment and carefulness" are now confined within narrower limits than before. The responsibility of the individual worker is greater, precisely because it is narrowed down so as to be related to and dependent on a number of other operatives in other parts of the same machine with whom he has no direct personal concern. Such realized responsibility is an element in education, moral and intellectual. But this responsibility is a direct result of the minute subdivision. It is, I think, questionable whether the vast majority of machine workers get any considerable education from the fact that the machine in conjunction with which they work represents a huge embodiment of the delicate skill and invention of many thousands of active minds, though some value may be accorded to Mr. Cooke Taylor's contention that "the mere exhibition of the skill displayed and the magnitude of the operations performed in factories can scarcely fail of some educational effect." Professor Shield Nicholson expresses himself more dubiously on the educational value of the machine: "Machinery of itself does not tend to develop the mind as the sea and mountains do, but still it does not necessarily involve deterioration of general mental ability."

The work of tending machinery is not of course to be regarded as absolutely automatic. To a certain limited extent the "tender" of machinery rules as well as serves the machine: in seeing that his portion of the machine works in accurate adjustment to the rest, the qualities of care, judgment, and responsibility are evoked. A great part of modern inventiveness, however, is engaged in devising automatic checks and indicators for the sake of dispensing with human skill and reducing the spontaneous or thoughtful elements of tending machinery to a minimum.

So far as the man follows the machine and has his work determined for him by mechanical necessity, the educative pressure of the latter force must be predominant. Machinery like everything else can only teach what it practices. Order, exactitude, persistence, conformity to unbending law—these are the lessons which must emanate from the machine. They have an important place as elements in the formation of intellectual and moral character. But of themselves they contribute a one-sided and very imperfect education.

5. It is often urged that the tendency of machinery is not merely

to render monotonous the activity of the individual worker, but to reduce the individual differences in workers. This criticism finds expression in the saying: "All men are equal before the machines." So far as machinery actually shifts upon natural forces work which otherwise would tax the muscular energy, it undoubtedly tends to put upon a level workers of different muscular capacity. Moreover, by taking over work which requires great precision of movement, there is a sense in which it is true that machinery tends to reduce the workers to a common level of skill, or even of un-skill.

But this is by no means all that is signified by the "equality of workers before the machine." It is the adaptability of the machine to the weaker muscles and intelligence of women and children that is perhaps the most important factor. The machine in its development tends to give less and less prominence to muscle and high individual skill in the mass of workers, more and more to certain qualities of body and mind which not only differ less widely in different men, but in which women and children are more nearly on a level with men.

It must, I think, be recognized that machinery does exercise a certain equalizing effect by assigning a larger and larger relative importance to those faculties which are specific as compared with those which are individual. The antagonism between machinery and art in this respect is fundamental and irreconcilable. So long and so far as the public continue to sink their individual differences as consumers and employ their expanding powers of purchase in demanding increased quantities of the same kinds of consumptive goods, machinery, with its economic faculty of exact, cheap, and rapid reproduction, will gain an increasing control over the processes of production. When the public becomes more individualistic in its consumption, in demanding greater variety and adaptability to individual taste, instead of immense quantity, this new character of consumption will reduce the advantages enjoyed by machinery, and will operate as an increased demand for art in the sense of individual effort of production.

See also:
"Industrial Accidents and Disease," page 604.
"Unemployment," page 611.
"Hours of Work," page 623.

5. IS MAN MASTER OR SERVANT?[27]

Let me suggest that human beings are instruments of production utilized by machines for the machines' increase and biological development. This is not a new idea. Samuel Butler carried it to the point of suggesting that machines might develop consciousness and thus enslave mankind; Veblen has described how machines train and educate human beings; A. S. Johnson has pointed out how the nominal captain of industry is ruled by the processes he presides over. The economic interpretation of history implies that the machines control human life and organization in its highest forms.

Machines may be conceived as making bargains with man in which they offer him things he very much desires, and in exchange bind him to serve and maintain them, to eliminate the unfit among them and promote their racial progress; they bind him to alter his own social and political arrangements in whatever ways may be necessary in keeping pace with the increasingly complex social organization of the machines themselves, and in keeping the children of man faithful to the service the machines require. The full nature of the terms of these bargains are not revealed to man until he is so fully committed that it is too late to turn back, and thus the machines outwit him.

Some might think this shows a low standard of honesty on the part of the machines, but we must remember that honesty is the morality of equals toward equals, not of superior to inferior races, and that our own conduct toward inferior races will hardly stand a critical examination. At least machines have not forced their culture upon us by armed violence.

The machines appear to have kind intentions toward man, but to lack understanding of many of his feelings and needs; as is frequently the case with ruling and subject races. They have revolutionized both work and product, taking the element of universal individual initiative out of both. They have given man unnatural working conditions which are now leading to incipient revolt, and living conditions that go far to defeat democracy. They are responsible for the "industrial cycle," and as long as their own overhead costs are covered in periods of depression, they have not assumed full responsibility for the corre-

[27] Adapted from John Maurice Clark, "Soundings in Non-Euclidean Economics," *American Economic Review,* XI, No. 1, Supplement (1921), 140–43; and "The Empire of Machines," *Yale Review,* XII (1922), 132–43, by special permission of the editors.

sponding overhead costs of human beings. They have largely taken over the drama without caring to preserve what human beings regard as the highest standards of taste, and they have, intentionally or unintentionally, gone far to undermine the church and even religion itself. They have incontinently switched us from a paternalistic to a laissez-faire type of government and are now busily switching us back again, according to the temporary needs of the stage of development they have reached. These are merely examples.

As for their methods of maintaining control: some classes they bribe with large rewards, other classes, largely technicians and technical scientists, do not need to be bribed: their minds are captured by the material they work in. And the unspecialized "ruling classes," voters or congressmen or others, cannot cope with these specialists, who are left to do more and more of the governing in the shape of the actual working out of things. The ordinary man cannot even speak the dialect in terms of which many of these issues are settled; for example the accounting language used in settling the justice of street-car fares. The machines have cleverly limited human cooperation by splitting human language up into many dialects of many specialist groups, so that the highest common factor of intelligibility, so to speak, for humanity as a whole, consists of relatively simple ideas, largely obsolete in the sense of not actively gripping the newer issues. As men become more dependent on machines, the latter become able to rule by penalties as well as by rewards: for example, our heatless Mondays and other penalties were imposed by failure to develop our railroad system to a continually increasing size and complexity of articulation. Thus mankind moves in directions it never intended, getting largely things it never definitely wanted as the unexpected result of engaging the services of unexpectedly powerful instruments.

I do not advocate revolting against the machines and abolishing or subjugating them: all I aspire to is a reasonable degree of racial equality. This would make for more friendly relations and would help to allay the distrust of the purposes of the machines which now prevents us from getting all the benefits which they are able and willing to give us. We must become far better informed and surer of our own intentions before our dealings with the machines can be characterized by that confidence which marks the bargaining of equals. To attain

this we must not merely develop the ability to rise superior, if necessary, to the immediate bribe that is offered us; we must become competent to bargain, as the machines do, with an intelligent eye to our long-run racial and social interests.

These interests are most seriously threatened in the case of labor. The machines tend to confine discretion in industry to the few whom they take into their confidence, while the bulk of labor has largely lost the power to make any constructive contribution to the technique of industry. The job belongs to the machine, and labor feels little responsibility for it. Labor's state of mind and conduct shows the consequences of this, and many laborers appear to alternate between the slave-morality of getting as much as possible and giving as little, and the spasmodic need of exerting power of some sort. Under the circumstances this can only be power to interfere with the orderly progress of industry by strikes or sabotage, since power to improve on the operations laid down by the machines appears to be beyond labor's present reach, either for lack of competence, ambition, or opportunity. Racial equality can never be established so long as the bulk of mankind are in this position of undignified and passive inferiority.

And what a wonderful race these monstrous beings are! They are powerful, tireless, and accurate. Physical achievements aside, they have already superseded the human mind at many of the routine mental operations of calculating and recording. When a man does not trust his own accuracy, he calls in an adding machine. He sets a recording clock as a sentinel over his workmen, and for detective work uses a cash register or a dictaphone. And when he wants to safeguard funds so that even he himself cannot get at them till the appointed time, he hands his discretion over to a time-lock.

But the more significant qualities of machines are less obvious and are only seen when we look at their social behavior. Their capacity for organization and their moral qualities are little short of marvelous, far transcending the rudimentary intelligence displayed by individual machines, as we are able to observe it. Here, for the first time in history, we have a race of beings devotedly striving, not for selfish indulgence or temporary gratification but for the biological advancement of the race. Not merely that, but they pay other beings to promote their biological development by the most rapid and ruthless se-

lection of the fit. Their bent for specialized cooperation is so strong that it is sometimes difficult to tell whether they are a race of individuals or cells in some single organism. And lastly, they have domesticated man to their service in such shrewd fashion that only a few have been dimly aware of what was happening to us.

And yet it is plain to see, if one will but look. Not merely because the peoples of entire towns are ruled by the whistles of a few factories and rise, eat, go to work, rest, toil, and sleep again at the bidding of these impersonal monitors. Not merely because the throngs of vehicles and pedestrians in the main traffic arteries of New York, Philadelphia, Detroit, and other large cities, must stop and move again at the command of signal lights synchronized from a central station. Such things are exhibitions of gratuitous bravado on the part of the machines, but whistles and lights are not the real rulers of men. More important are the machines that brought these crowded populations together, built our congested cities, and now govern the character of their working life.

Ride through the industrial district stretching from South Chicago to Gary, and as you view the expanse of ugly flats and barrens, ask yourself why these people are here. Is this a place men would choose to live in? Certainly not, if they were free to move out to those blue, wooded hills beckoning in the distance. These people never wanted to live here. But the machines did, and that settled it. If you wish to see who it was that found this site desirable, look yonder at that row of pot-bellied Titans with their grotesquely sprawling limbs, squatting near a feed-trough that looks at least a quarter of a mile in length. Behold, my friends, the only beings who actually wanted to live here, out of a total population of a hundred thousand people and six blast furnaces! The rest are here because the furnaces are here and for no other reason. They either were bribed or came under duress of earning their bread, to this place of dreary flatness.

The things the machines have done to us are so manifold that one hardly knows where to begin; with industry and labor, with the industrial cycle, with art and the drama, language, government, war, crime, science, morals, or religion.

6. THE BRUTE[28]

Through his might men work their wills.
They have boweled out the hills
For food to keep him toiling in the cages they have wrought;
And they fling him, hour by hour,
Limbs of men to give him power;
Brains of men to give him cunning; and for dainties to devour
Children's souls, the little worth; hearts of women, cheaply bought:
He takes them and he breaks them, but he gives them scanty thought.

For about the noisy land,
Roaring, quivering 'neath his hand,
His thoughts brood fierce and sullen or laugh in lust of pride
O'er the stubborn things that he
Breaks to dust and brings to be.
Some he mightily establishes, some flings down utterly.
There is thunder in his stride, nothing ancient can abide,
When he hales the hills together and bridles up the tide.

Quietude and loveliness,
Holy sights that heal and bless,
They are scattered and abolished where his iron hoof is set;
When he splashes through the brae
Silver streams are choked with clay,
When he snorts the bright cliffs crumble and the woods go down like hay;
He lairs in pleasant cities, and the haggard people fret
Squalid 'mid their new-got riches, soot-begrimed and desolate.

They who caught and bound him tight
Laughed exultant at his might,
Saying, "Now behold, the good time comes for the weariest and the least!
We will use this lusty knave:
No more need for men to slave:
We may rise and look about us and have knowledge ere the grave."
But the Brute said in his breast, "Till the mills I grind have ceased,
The riches shall be dust of dust, dry ashes be the feast!

"On the strong and cunning few
Cynic favors I will strew;

[28] Taken by permission from W. V. Moody, *Poems and Plays*, Vol. I, pp. 55–60. (Houghton Mifflin Co., 1912.)

I will stuff their maw with overplus until their spirit dies;
From the patient and the low
I will take the joys they know;
They shall hunger after vanities and still anhungered go.
Madness shall be on the people, ghastly jealousies arise;
Brother's blood shall cry on brother up the dead and empty skies.

"I will burn and dig and hack
Till the heavens suffer lack;
God shall feel a pleasure fail Him, crying to his cherubim,
'Who hath flung yon mud-ball there
Where my world went green and fair?'
I shall laugh and hug me, hearing how his sentinels declare,
' 'Tis the Brute they chained to labor! He has made the bright earth dim.
Store of wares and pelf a plenty, but they got no good of him.' "

So he plotted in his rage:
So he deals it, age by age.
But even as he roared his curse a still small Voice befell;
Lo, a still and pleasant voice bade them none the less rejoice,
For the Brute must bring the good time on; he has no other choice.
He may struggle, sweat and yell, but he knows exceeding well
He must work them out salvation ere they send him back to hell.

All the desert that he made
He must treble bless with shade,
In primal wastes set precious seed of rapture and of pain;
All the strongholds that he built
For the powers of greed and guilt—
He must strew their bastions down the sea and choke their towers with silt;
He must make the temples clean for the gods to come again,
And lift the lordly cities under skies without a strain.

In a very cunning tether
He must lead the tyrant weather;
He must loose the curse of Adam from the worn neck of the race;
He must cast out hate and fear,
Dry away each fruitless tear,
And make the fruitful tears to gush from the deep heart and clear.
He must give each man his portion, each his pride and worthy place;
He must batter down the arrogant and lift the weary face,
On each vile mouth set purity, on each low forehead grace.

Then, perhaps, at the last day,
They will whistle him away,
Lay a hand upon his muzzle in the face of God, and say,
"Honor, Lord, the Thing we tamed!
Let him not be scourged or blamed,
Even through his wrath and fierceness was thy fierce wroth world reclaimed!
Honor Thou thy servants' servant; let thy justice now be shown."
Then the Lord will heed their saying, and the Brute come to his own,
'Twixt the Lion and the Eagle, by the armpost of the Throne.

CHAPTER V

THE PERSONAL FACTOR IN PRODUCTION: LABOR

Purposes of this chapter:

1. To understand the basic elements of the labor force in any economic order.
2. To study the position of the worker in the modern producing system.
3. To grasp the problems involved in securing and maintaining an effective working force.
4. To sense the significance of the conservation of human energy and to note some of the methods by which it may be accomplished.

Thus far in the discussion of our producing activities we have canvassed the part played by natural resources (earth features and earth resources), and the part played by culture in both its non-physical and its physical aspects. We turn now to the personal factor in production, devoting this chapter to labor and the following chapter to enterprise and management.

This current chapter by no means attempts to cope with all the issues connected with "labor" in our economic order; a very considerable number of these issues are postponed to Part III, where a discussion of the labor market is a part of the treatment of the larger topic, the co-ordination of specialists in our society. At the present time our point of view is confined to seeing labor in the productive process. This arbitrary division of the discussion of labor is, like all such classifications, somewhat unreal and can be justified only as a method of exposition.

We begin by reflecting upon the component parts of "the labor force" of any economic order and especially by getting a fairly clear understanding of the composition of the labor force of our own country today. Of course, our labor force operates in the main under a

wage system. The advantages and disadvantages to labor of our type of economic organization will be surveyed, and a view will be had of the institutional life which has come into existence in this connection. Since the greater part of our labor force works in business units (even a governmental bureau or a philanthropic establishment may be regarded as a business unit for this purpose) we shall need to know the conditions of effective performance under such circumstances. A discussion of conservation—wise utilization—of human energy ends the chapter.

A. Present-Day Workers

No one should be a slave to definitions, but it will facilitate discussion if we are reasonably clear concerning what we mean by labor.

To begin with, labor, as the term is here used, does not include the effort of animals, such as horses or oxen; that effort is regarded as a service flowing from one type of capital goods. So also, and for the same reason, labor does not refer to the services of machines or tools. Labor, as here discussed, has reference only to the effort of free human beings, and not even to all such effort. The effort of a person engaging in a game for the game's sake is play. Only human effort that is undertaken, not as an end in itself, but as a means to an end—usually in the expectation of remuneration—is labor.

Labor even thus defined is a broad term. It includes independent workers who "work for themselves," and also dependent workers who "work for others." In the present chapter, however, we confine our attention to those "dependent workers" who "work for others" under the operations of the wage system. It is to be noticed that even as regards this group, the labor of managerial workers is treated in the following chapter.

Our first task is that of ascertaining the elements of labor force, as thus defined. The labor force of a given area depends in part upon the size of the population, in part upon the age and sex distribution of this population, in part upon the powers of the individual members of the population, and in part upon the will-to-do of these members—upon these and other factors.

Concrete evidence concerning the component parts of our own labor force and concerning its distribution into various occupations is, fortunately, available in the data from our census.

The following pages will be examined with greater profit if these issues[1] are kept in mind.

1. What part (considered both proportionally and in absolute numbers) of our population is gainfully employed?
2. What proportion of the gainfully employed are wage-earners?
3. What part is played by women in our labor force?
4. What significant shifts have occurred in our labor force in the last two generations?
5. Under what circumstances and conditions may we expect the individual workman to be efficient?

1. SOME DEFINITIONS OF LABOR

"Labor is a wealth-creating effort. . . . ."—J. B. Clark, *Essentials of Economic Theory,* chap. i.

"The term labor . . . . includes all human exertion. . . . ." —Henry George, *Progress and Poverty,* Book I, chap. ii.

"Labor is any human effort having an aim or purpose outside of itself."—F. A. Fetter, *The Principles of Economics,* chap. xx.

"Labor is the application of human faculties to the production of wealth."—A. S. Johnson, *Introduction to Economics,* chap. x.

"Labor is the voluntary exertion of bodily or mental faculties for the purpose of production."—N. W. Senior, *Political Economy.*

"We may define labor as any exertion of mind or body undergone partly or wholly with a view to some good other than the pleasure derived directly from the work."—Alfred Marshall, *Principles of Economics,* Book II, chap. iii.

"Labor may be properly defined as any sort of action or operation, whether performed by man, the lower animals, machinery, or natural agents, that tends to bring about any desirable result."—J. R. M'Culloch, Supplemental Note I to Smith's *Wealth of Nations.*

"Labor. 1. Exertion of the faculties of the body or mind, especially when painful or compulsory; bodily or mental toil.

"2. Physical exertion directed to the supply of the material wants of the community; the specific service rendered to production by the laborer and artisan."—Murray, *New English Dictionary.*

[1] A more detailed statement of issues may be found in *Outlines of the Economic Order,* pp. 120–23. (The University of Chicago Press.)

"Labor is . . . . a process in which both man and Nature participate, and in which man of his own accord starts, regulates, and controls the material reactions between himself and Nature. He opposes himself to Nature as one of her own forces, setting in motion arms and legs, head and hands, the natural forces of his body, in order to appropriate Nature's productions in a form adapted to his own wants."—Karl Marx, *Capital* (Engel's translation), Vol. I, chap. vii.

"Labor is either bodily or mental; or, to express the distinction more comprehensively, either muscular or nervous; and it is necessary to include in the idea, not solely the exertion itself, but all feelings of a disagreeable kind, all bodily inconvenience or mental annoyance, connected with the employment of one's thoughts, or muscles, or both, in a particular occupation. . . . .

"Labor . . . . in the physical world, is always and solely employed in setting objects in motion; the properties of matter, the laws of nature, do the rest."—John Stuart Mill, *Principles of Political Economy*, Book I, chap. i.

2. THE WAGE-EARNING CLASS[1a]

We now have a fairly permanent wage-earning class, forming a large proportion of the population, engaged in many occupations, and including many women and children.

In the colonies almost every worker either was his own master or expected to become a master craftsman, farmer, or merchant: to be independent of employment by other men. Today there are still independent employers, farmers, and merchants, but in contrast with colonial times the great majority of workers are employed by others. They do not own the tools with which they work, have minor control over the hours and conditions of their work, and are not responsible for the management of the plant in which they are employed. These workers receive wages in return for their work and are called wage-earners.

Who are the wage-earners and how big a group do they form?—The proportion of the persons gainfully occupied, by which we mean engaged in an occupation for profit or wages, who are included in the wage-earning class has grown rapidly in the last fifty years. From the figures on the following page we can see that over one-half of the gain-

[1a] Prepared by Mildred J. Wiese.

fully employed persons in this country now may be included in the wage-earning class. In making this table three classes of persons were included among the proprietary and independent workers, and four

NUMBER OF WORKERS IN DESIGNATED CLASSES IN THE UNITED STATES IN 1870 TO 1920*

Groups	1870	1880	1890	1900	1910	1920
Farm laborers	2,885,996	3,323,876	3,004,061	4,410,877	6,143,998	4,178,637
Farmers	3,000,229	4,282,074	5,380,181	5,770,738	6,229,161	6,463,708
Proprietors and officials	581,378	807,049	1,347,329	1,811,715	2,879,023	3,168,418
Professional	414,708	666,338	1,114,507	1,565,686	2,074,792	2,760,190
Lower salaried	309,413	529,473	965,852	1,329,928	2,393,620	3,985,306
Servants	975,734	1,075,655	1,454,791	1,453,677	1,572,225	1,270,946
Industrial wage-earners	3,328,351	5,286,829	7,360,442	10,263,569	14,556,979	17,648,072
Unclassified	1,019,114	1,420,795	2,118,498	2,467,043	2,317,538	2,138,971
Total	12,505,923	17,392,099	22,735,661	29,073,233	38,167,336	41,614,248

* Tables compiled and plan of analysis worked out by Alvin H. Hansen "Industrial Class Alignments in the United States," *American Statistical Association Quarterly*, December, 1922, p. 504.

THE PROPORTION OF WORKERS IN DESIGNATED CLASSES IN THE UNITED STATES: 1870 TO 1920*

Groups	1870	1880	1890	1900	1910	1920
Farm laborers	23.1%	19.1%	13.2%	15.2%	16.1%	10.0%
Farmers	24.0	24.6	23.6	19.8	16.3	15.5
Proprietors and officials	4.6	4.6	5.9	6.2	7.5	7.6
Professional	3.3	3.8	4.9	5.4	5.4	6.6
Lower salaried	2.5	3.0	4.3	4.6	6.3	9.6
Servants	7.8	6.2	6.4	5.0	4.1	3.1
Industrial wage-earners	26.6	30.4	32.4	35.3	38.2	42.4
Unclassified	8.1	8.2	9.3	8.5	6.0	5.1
Total proprietary and independent	44.3	43.3	41.5	39.6	37.9	34.3
Wage-workers	47.6	48.6	49.2	51.9	56.0	60.5
Unclassified	8.1	8.2	9.3	8.5	6.0	5.1

* Tables compiled by Alvin H. Hansen, "Industrial Class Alignments in the United States," *American Statistical Association Quarterly*, December, 1922, p. 504.

among the wage-earners. Included in the proprietary and independent workers are (1) farmers, (2) proprietors and officials, and (3) the professional class. "Farmers" include farm-owners, tenants, and children of the farmers. "Proprietors and officials" include such workers as manufacturers; proprietors; superintendents; mining operators; mechanical engineers; bankers; brokers; real estate and insur-

ance agents; commercial travelers; merchants and dealers at retail and wholesale; auctioneers; jewelers (not workers); garage-keepers; restaurant and hotel-keepers; and officials and managers in any business enterprise. The professional class includes not only doctors, lawyers, teachers, and similar groups regularly referred to as professional, but also untrained nurses and such public-service groups as detectives, sheriffs, marshals, policemen, government officials, soldiers, sailors, and marines, and life-savers.

Among the wage-earners are included (1) farm laborers, (not including children of farmers), (2) industrial wage-earners, (3) lower-salaried employees, and (4) servants. "Industrial wage-earners" include all wage-earners except servants, farm laborers, and that portion of the wage-earning class which falls for lack of clear census designation into the unclassified group. Clerks and copyists, foremen and overseers, stenographers and typists, bookkeepers and accountants, agents and collectors, inspectors and samplers, demonstrators, sales agents, ticket and station agents, express agents, baggagemen and freight agents, mail carriers, chauffeurs, housekeepers, and stewards have all been grouped together under the designation "lower-salaried employees."

The wage-earning class has formed an increasingly large proportion of our gainfully employed population growing from 47.6 per cent to 60 per cent in fifty years. The figure for 1920 might be even larger if the 1920 census had not been taken in January when the number of farm laborers is reduced to a minimum. Judging from these figures there can be no doubt that the wage-earners are an exceedingly important part of our gainfully employed population.

A classification of workers gives interesting information.—Another classification may be worked out from the percentage table. Farm laborers and farmers together in 1920 formed only about one-fourth of the gainfully occupied population, the former group being somewhat smaller than the latter. Proprietors and officials although a steadily increasing group since 1870 included only 7.6 per cent of the total in 1920. The professional class composes 6.6 per cent of the total number engaged in gainful occupations, or a little less than one in fifteen. Domestic and personal servants have since 1870 formed a de-

creasing proportion of the population engaged in gainful occupations, being the smallest group in 1920 with 3.1 per cent. The number and

CHANGES IN THE PROPORTION OF WOMEN GAINFULLY EMPLOYED IN THE UNITED STATES BETWEEN 1880 AND 1920*

Year	Percentage of Total Number of Women	Number of Women Gainfully Employed
1880	14.7	2,647,000
1890	14.4	4,005,000
1900	18.8	5,319,000
1910	23.4	8,076,000
1920	21.1	8,549,000

* *Fourteenth Census of the United States, Abstract of Occupation Statistics* (1923), p. 481. The apparent decrease in the percentage of women gainfully employed in 1920 is not wholly a real decrease. Owing to a change in the method of taking the census in 1910 the number for that year is greatly exaggerated. About 1,000,000 too many women working on farms were included as gainfully employed in that year but do not appear in the other census figures.

OCCUPATIONS IN WHICH WOMEN EMPLOYED EXCEED MEN, 1920*

Occupation	Number of Women	Number of Men
School teachers	635,207	116,848
Stenographers and typists	564,744	50,410
Launderers and laundresses not in laundries	385,874	10,882
Clothing factory operatives	265,643	143,718
Dressmakers and seamstresses not in factories	235,519	336
Housekeepers and stewards	204,350	17,262
Telephone operators	178,379	11,781
Trained nurses	143,664	5,464
Boarding and lodging-house keepers	114,740	18,652
Cigar and tobacco factory operatives	83,960	61,262
Knitting mill operatives	80,682	26,922
Silk mill operatives	72,768	42,953
Musicians and teachers of music	72,678	57,587
Candy, factory operatives	31,368	20,913
Religious, charity and welfare workers	26,927	14,151
Paper box factory operatives	13,375	7,077
Librarians	13,502	1,795
Lace and embroidery mill operatives	12,997	6,086

* *Fourteenth Census of the United States* (1920), Vol. IV, *Occupations*, pp. 35–43.

proportion of lower-salaried employees has grown fairly rapidly, forming, in 1920, 9.6 per cent of all workers. By far the largest group was that of industrial wage-earners. Forty-two and four-tenths per cent or well over two-fifths of the total number of gainfully occupied

people in this country were in this class. This, in itself, would be sufficient reason for giving special attention to the industrial wage-earner in a study of the worker in our society.

OCCUPATIONS EMPLOYING LARGEST NUMBER OF WOMEN WORKERS, 1920[2]

Servants[3]	1,012,133
Farm laborers[4]	792,915
Teachers	639,241
Stenographers and typists	564,744
Clerks (except in stores)	472,163
Laundresses (not in laundries	385,874
Saleswomen[5]	361,142
Bookkeepers, cashiers, and accountants	359,124
Clothing factory operatives	265,643
Farmers	253,836
Dressmakers (not in factories)	235,519
Housekeepers and stewardesses	204,350
Telephone operators	178,379
Clerks in stores	170,397
Cotton-mill operatives.	149,185
Trained nurses	143,664
Nurses, not trained	132,658
Waitresses	116,921
Boarding- and lodging-house keepers	114,740
Total	6,552,669

Women and children form an important part of the wage-earning class.—Before the industrial and economic revolution there were few occupations outside of domestic service open to women seeking gainful employment. Most women found plenty of work in the home, and their work there was a very necessary contribution to the livelihood of the family. With the growth of machine industry, of large-scale production, and the great increase in specialization, more and more of the tasks formerly carried on in the home have been taken over by factories. Women no longer use the home as a place to spin cotton and flax and weave clothing. In many, many homes the women do not bake the bread or can the fruits and vegetables needed by the family. Great factories provide ready-made clothing, laundries and cleaning establishments keep our clothes and linens clean, bakers provide bread and cake, canneries provide fruits, vegetables, and ready-cooked fish and meats, and at times the delicatessen store, restaurant, or hotel provides the entire meal. Many of these tasks can be performed more efficiently and cheaply outside

[2] From *Fourteenth Census of the United States, 1920*, Vol. IV, *Occupations*, pp. 35–43.

[3] Includes 268,618 cooks.

[4] Includes 576,642 on home farm.

[5] Includes 356,321 in stores.

the home. Women, particularly in cities, do not need to work so hard in the home as their grandmothers did. But the tasks which grandmother performed must be accomplished today even if they are not carried on in the home, and when they are done outside the home they must be paid for. It is not surprising to find a steady increase in the number of women who have followed their work from the home into the factories and mills. Where formerly home duties required all the time of mother, daughters, and perhaps a servant or two, now the mother frequently bears the burden of the home alone, and the daughters and former servants may be found in offices and factories. Of the 40.5 million of women and girls in the United States some 8.5 million, or more than one-fifth of the total, are gainfully employed, and the proportion of those gainfully employed has increased from 14.7 cent in 1880 to 21.1 in 1920.

Not only have women followed the work formerly done in the home to the factory but children, too, are employed in large numbers. Machine industry and minute specialization have created simple tasks which children can perform, and the wages they receive often are a

PROPORTION OF CHILDREN GAINFULLY EMPLOYED IN THE UNITED STATES, 1920*

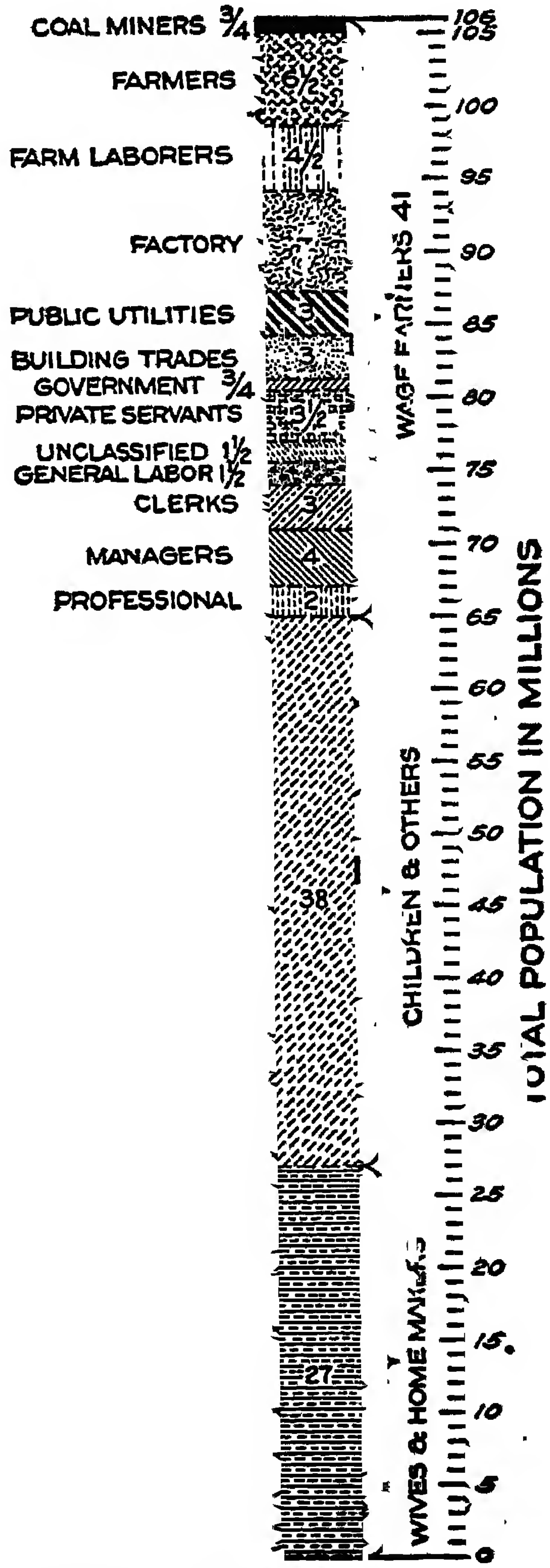
	Absolute Number	Number Gainfully Employed	Percentage Gainfully Employed
Children between 10 and 15 years of age	12,502,582	1,060,858	8.5
Boys between 10 and 15 years of age	6,294,985	714,248	11.3
Girls between 10 and 15 years of age	6,207,597	346,610	5.6

* *Abstract of Occupation Statistics* (1920), p. 534.

grateful addition to the family income. The census figures show the number of children ten years of age or over gainfully employed. This will give us a fairly accurate picture of the total number of children at work for there are not many at work under ten years of age. In all but five states children under fourteen years are prohibited by law from being employed in general factory work, and all states forbid employment of children in certain kinds of work. In spite of the fact that there has been much agitation against child labor, and that many

states have laws against it, there are still well over a million children under fifteen years of age gainfully employed in the United States. Some conservative writers say there are two million gainfully employed.

The figures in the table on the foregoing page (the Census Bureau in January, 1920) do not include as gainfully occupied many children who work on farms during the greater part of the year, since in January there is little work to do on farms and most of these young farmers are at school. Also, of course, the census could not include children gainfully occupied in violation of the law, for example those claiming to be above the legal age limit, and young children helping their parents in home occupations, such as making artificial flowers, boxes, and similar products. Undoubtedly the stricter enforcement of child-labor laws, and the enactment of new laws against child labor, as well as the more efficient enforcement of compulsory school attendance laws, have been important factors in decreasing the number of children thus illegally at work. Several attempts have been made to secure federal legislation against child labor but these have been declared unconstitutional.



Courtesy of S. S. Wyer

The Occupational Groups in the United States (in Millions)

The changes brought about in the course of the development of modern industrial organization have given rise to problems of importance to all workers, but in each group of problems which have arisen

OCCUPATIONAL DISTRIBUTION

I. Number and Proportion of Persons Gainfully Employed in the United States, 1880–1920

Year	Number of Persons 10 Years of Age and Over Gainfully Employed	Number of Males 10 Years of Age and Over	Number of Females 10 Years of Age and Over	Percentage These Persons Are of Population Which Is 10 Years of Age and Over	Percentage These Males Are of Total Male Population 10 Years of Age and Over	Percentage These Females Are of Total Female Population 10 Years of Age and Over
1880.....	17,392,099	14,744,942	2,647,157	47.3	78.7	14.7
1890.....	23,318,183	19,312,652	4,005,531	49.2	79.3	17.4
1900.....	29,073,233	23,753,836	5,319,397	50.2	80 0	18.8
1910.....	38,167,336	30,091,564	8,075,772	53.3	81.3	23.4
1920.....	41,614,248	33,064,737	8,549,511	50.3	78.3	21.1

II. Total Persons Ten Years of Age and Over Engaged in Gainful Occupations, 1920

Occupations	Number	Per Cent	Per Cent	
			Males	Females
All occupations..................	41,614,248	100.0	100.0	100.0
Agriculture, forestry, and animal husbandry....................	10,953,158	26.3	29.8	12.7
Extraction of minerals.............	1,090,223	2.6	3.3	*
Manufacturing and mechanical industries........................	12,818,524	30.8	32.9	22.6
Transportation..................	3,063,582	7.4	8.6	2.5
Trade..........................	4,242,979	10.2	10.8	7.8
Public service (not elsewhere classified).........................	770,460	1.9	2.3	0.3
Professional service..............	2,143,289	5 2	3.4	11.9
Domestic and personal service......	3,404,892	8.2	3.7	25.6
Clerical occupations...............	3,126,541	7.5	5.1	16.7

* Less than 0.1 of 1 per cent.

III. Per Cent Distribution by Sex of the Persons in Each General Division of Occupations, 1920

Division of Occupation	Males Per Cent	Females Per Cent	All Per Cent
All occupations.........................	79.5	20.5	100.0
Agriculture, forestry, and animal husbandry..	90.1	9.9	100.0
Extraction of minerals..................	99.7	0.3	100.0
Manufacturing and mechanical industries....	84.9	15.1	100.0
Transportation	93.0	7.0	100.0
Trade..................................	84.3	15.7	100.0
Public service (not elsewhere classified)......	97.2	2.8	100.0
Professional service......................	52.6	47.4	100.0
Domestic and personal service.............	35.8	64.2	100.0
Clerical occupations.....................	54.4	45.6	100.0

those of the wage-earner seem most difficult of solution. One reason for this may be that a separate wage-earning class is really quite new in this country. Until comparatively recently workers who could not rise in the industry in which they were employed could easily go west to the open frontier or could find opportunity in opening a small business for themselves. The wage-earning class was constantly changing. This is no longer entirely true. In recent years, as the frontier closed and large scale business developed, a more permanent class of wage-earners has come into existence. Grievances such as loss of control over wages, hours, or working conditions, monotony, lack of independence, and loss of skill, did not seem particularly serious to the worker who could expect to leave his irksome job and become manager or owner of his own business or farm. To the wage-earner who can see no better future before him such grievances assume gigantic proportions.

3. THE IMMIGRANT AND THE NEGRO IN OUR POPULATION[6]

In the population of the United States today there are representatives of almost every race and nation of the world. The colonies were English and most of their inhabitants came from England. It is believed that in 1790 over four-fifths of the people were English and the remainder were Scotch, German, Dutch, Irish or French. To this original colonial stock there has been added by immigration the peoples of many lands. The earlier immigrants came almost entirely from northwestern Europe, from Great Britain, Germany and the Scandinavian countries. They included many skilled craftsmen as well as many hardy farming pioneers and they included also unskilled workers, especially the "pick and shovel brigade" of the Irish. Since about 1880, however, there has been a great change in the source of our immigration. In 1882, 87 per cent of our immigrants were from northern and western Europe; 13 per cent from southern and eastern Europe. By 1907, the proportion had changed to 81 per cent from southern and eastern Europe and but 19 per cent from northwestern Europe. This "newer immigration" includes Italians, Greeks, Poles, Russians and other Slavs from middle and southeastern Europe. They have done

[6] Adapted from Wiese and Reticker, *The Modern Worker* (1929). Reprinted by permission of The Macmillan Company, publishers.

work in coal mines, in iron and steel industries, in packing plants, and in other large scale manufactures.

Immigration at present shows a great decrease because Congress has passed laws limiting the number of European immigrants who may enter each year to 150,000 in order that those already here may be assimilated into a unified nation. Each nation's proportion of the 150,000 is determined by the "national origin" of our present population. In consequence, Germany, Great Britain and the Scandinavian countries once more furnish the largest number of our new citizens

Immigration to the United States, 1820 to 1920, by Decades

Period	Immigrants	Percentage of Distribution by Decades	Average per Year
1820–30..........	151,824	0.4	13,802
1831–40..........	599,125	1.7	59,913
1841–50..........	1,713,251	5.1	171,325
1851–60..........	2,598,214	7.7	259,821
1861–70..........	2,314,824	6.8	231,482
1871–80..........	2,812,191	8.3	281,219
1881–90..........	5,246,613	15.5	524,661
1891–1900........	3,687,564	10.9	368,756
1901–10..........	8,795,386	26.1	879,539
1911–20..........	5,735,811	17.0	573,581
Total........	33,654,803	100.0	333,215

from Europe. As for immigration from Asia, it has practically been eliminated. No restriction has been placed on immigration from Canada, Mexico, and South America, Cuba and other West Indian Islands, and people from these countries now make up a large proportion of our total entrants. The demand of some industries for unskilled labor is now being met by Mexicans instead of Italians and Poles.

A recent study on immigration[7] points out that there are at the present time in this country over 45,000,000 descendants of the original colonial stock—well over one-third of the total population. In 1920 our total population was made up of 76.7 per cent native born white (which would include many "first generation American," the native born of foreign parentage); 13 per cent foreign born whites; and 9.9 per cent negroes. Thus one in every ten persons is colored;

[7] Niles Carpenter, *Immigrants and Their Children, 1920*, p. 4. (U.S. Department of Commerce, 1927.)

one in every eight is foreign born; two out of three are descendants of other than the original colonial stock.

In 1920 the Negro population of the United States numbered 10,-463,131.[8] This represented a 10-year increase of 635,000, or 6.5 per cent, the lowest thus far recorded. In consequence of this slow numerical progress the proportion formed by Negroes in the total population declined from 10.7 per cent in 1910 to 9.9 per cent in 1920. The highest proportion, 19.3 per cent, was recorded in 1790.

The following table throws some light on the distribution of the Negro population at different periods of American history:

NEGRO POPULATION

Census Year	Percentage in Southern States	Percentage Native Remaining in State of Birth	Percentage Urban	Percentage Rural
1890......	90.3	*85.2	19.8	80.2
1900......	89.7	84.4	22.7	77.3
1910......	89.0	83.4	27.4	72.6
1920......	85.2	80.1	34.0	66.0

* Relates to total colored population, including Indian, Chinese, and Japanese.

4. OCCUPATIONS IN MANUFACTURING

SKILLED WORKERS BY TRADES, 1920[9]

Bakers	97,940
Blacksmiths, forgemen and hammermen	221,421
Boiler makers	74,088
Brick and stone masons	131,264
Builders and building contractors	90,109
Cabinetmakers	45,511
Carpenters	887,379
Compositors, linotypers and typesetters	140,165
Coopers	19,066
Dressmakers and seamstresses (not in factory)	235,855
Dyers	15,109
Electricians	212,964
Electrotypers, stereotypers and lithographers	13,716
Engineers (stationary), cranemen, hoistmen, etc.	279,984
Engravers	15,053
Filers, grinders, buffers, and polishers (metal)	59,785
Firemen (except locomotive and fire department)	143,875
Foremen and overseers (manufacturing)	307,413
Furnacemen, smeltermen, heaters, pourers, etc.	40,806
Glass blowers	9,144

[8] Adapted from William S. Rossiter, *Census Monograph I*, "Increase of Population in the United States, 1910–1920." (Government Printing Office, 1922.)

[9] *Fourteenth Census of the United States, 1920*, Vol. IV, *Occupations*, pp. 35–39.

Jewelers, watchmakers, goldsmiths and silversmiths	39,592
Loom fixers	15,961
Machinists, millwrights and toolmakers	894,662
Managers and superintendents (manufacturing)	201,721
Manufacturers and officials	231,615
Mechanics (not otherwise specified)	281,741
Millers (grain, flour, feed, etc.)	23,272
Milliners and millinery dealers	73,255
Molders, founders, and casters (metal)	123,681
Oilers of machinery	24,612
Painters, glaziers, varnishers, enamelers, etc.	323,032
Paper hangers	18,746
Pattern and model makers	27,720
Plasterers and cement finishers	45,876
Plumbers and gas and steam fitters	206,718
Pressmen and plate printers (printing)	18,683
Rollers and roll hands (metal)	25,061
Roofers and slaters	11,378
Sawyers	33,809
Shoemakers and cobblers (not in factory)	78,859
Skilled occupations (not otherwise specified)	19,395
Stonecutters	22,099
Structural iron workers (building)	18,836
Tailors and tailoresses	192,232
Tinsmiths and coppersmiths	74,968
Upholsterers	29,605
Apprentices to building and hand trades	79,953
Apprentices to dressmakers and milliners	4,326
Apprentices to other	65,898
Total skilled workers and apprentices in manufacturing and mechanical industries	6,241,923

The number of semiskilled workers in manufacturing was placed at 3,686,301; the number of laborers at 2,877,092.

5. THE PROFESSIONAL GROUP

It must be admitted that no one knows exactly what we mean by the term professional workers. It certainly includes persons who *render services* rather than *make things;* it usually implies that training is necessary to perform the task well; it is usually thought to refer to persons who are not content merely to make money but strive in some definite way for the betterment of mankind; and it is sometimes used as if a "professional" person were a person of high school standing.

Whatever the term may mean, a fairly good impression of the relative importance of the various professional ties may be seen from the accompanying tabulation. Homemakers head the list; then come, in order, teachers, medical workers, entertainers and artists, engineers, clergymen, lawyers, social workers, writers, and others. It does not

take much imagination to see in this list relief from pain, inspiration to better living, increased knowledge, and growing mastery of nature.

The way this work is divided up between men and women is very

PROFESSIONAL WORKERS WHO GIVE SERVICE THAT PEOPLE USE DIRECTLY FOR THEIR OWN ENJOYMENT OR IMPROVEMENT[10]

	Total	Male	Female
Medical workers	368,781	214,405	154,376
Physicians and surgeons	144,977	137,758	7,219
Dentists	56,152	54,323	1,829
Osteopaths	5,030	3,367	1,663
Trained nurses	149,128	5,464	143,664
Veterinary surgeons	13,494	13,493	1
Social workers	41,078	14,151	26,927
Clergymen	127,270	125,483	1,787
College presidents and professors	33,407	23,332	10,075
Teachers	761,766	122,525	639,241
Librarians	15,297	1,795	13,502
Writers	40,865	32,129	8,736
Authors	6,668	3,662	3,006
Editors and reporters	34,197	28,467	5,730
Entertainers and artists	248,098	139,330	108,768
Actors and showmen	48,172	33,818	14,354
Painters, sculptors, and teachers of art	35,402	20,785	14,617
Musicians and teachers of music	130,265	57,587	72,678
Photographers	34,259	27,140	7,119
Home-makers	21,318,933	....	21,318,933

PROFESSIONAL WORKERS CONCERNED MOSTLY WITH HELPING THE BUSINESS MAN IN SOME OF HIS TASKS

	Total	Male	Female
Engineering professions	239,713	230,294	9,419
Engineers	136,121	136,080	41
Designers	15,410	9,758	5,652
Draftsmen	52,865	50,880	1,985
Inventors	2,376	2,349	27
Chemists, assayists, and metallurgists	32,941	31,227	1,714
Architects*	18,185	18,048	137
Lawyers*	122,519	120,781	1,738
Public accountants, about	6,000	....	†

* Do much work also directly for people not in business.

† Only a few.

[10] L. S. Lyon, *Making a Living*, pp. 340–41. (The Macmillan Company, 1926.)

interesting. Our doctors, our clergymen, our college professors, our editors, our engineers, our architects, our lawyers, and our accountants are mostly men. On the other hand, our trained nurses, our social workers, our public-school teachers, our librarians, and of course our home-makers are mostly women. Occupations in which the sexes are fairly well balanced are not numerous; the entertainers and artists and the authors are about the only really good cases of an even balance.

6. MOST WORKERS ARE IN LARGE ESTABLISHMENTS[11]

In 1925 there were five manufacturing industries which, the country over, employed more than 300,000 workers each; these will be examined in turn. (1) By far the largest number of establishments in *lumber and timber products* are small scale, more than three quarters of them so small that their output was less than $100,000 each in 1925. These many small establishments, however, employed but 15 per cent of the 473,998 workers in the industry; whereas the 3 per cent of the plants which each had a product of a million dollars or more employed 38 per cent of the wage earners. (2) The 8,154 *foundries* are also typically small scale, 61 per cent being in the less than $100,000 group. But these many small foundries employ only 10 per cent of the wage earners in the industry; whereas 48 per cent are employed in large groups in the few foundries with over a million dollar output. (3) The establishments for *general construction and repairs of railroad cars* (1,842 plants) and for the manufacture of (4) *cotton goods* (1,366 plants) are predominately "middle sized." Yet 66 per cent of the wage earners in construction and repairs of steam railways and 77 per cent in cotton goods manufacture are in large groups in a small number of the larger establishments. (5) *Steel works and rolling mills* are predominately large scale with 66 per cent of the establishments producing more than a million dollars worth of goods per establishment per year and employing more than 99 per cent of the workers. So far as these industries are concerned—and they are significant because the country over they employ larger numbers than do other industries—the census figures justify the statement that industry still op-

[11] Adapted from Wiese and Reticker, *The Modern Worker* (1929). Reprinted by permission of The Macmillan Company, publishers.

erates on all scales—large, medium and small—but even in the industries which have many small establishments, the majority of workers are in the large establishments working together in large groups.

INDUSTRIES, IN WHICH AT LEAST NINE-TENTHS OF THE WORKERS ARE IN LARGE GROUPS IN ESTABLISHMENTS WITH ANNUAL PRODUCTS OF $1,000,000 OR MORE, 1925*

	I Total Number of Establishments†	II Total Number of Wage Earners‡	III Number of Large Scale Establishments§	IV Percentage of Large Scale Establishments	V Percentage of Wage Earners in Large Scale Establishments	VI Average Number of Wage Earners in Large Scale Establishments
Sugar refining	21	14,502	21	100	100	690
Smelting and refining copper	26	15,588	26	100	100	600
Smelting and refining lead	17	6,115	17	100	100	360
Rubber boots and shoes	23	24,999	19	83	99	1,300
Rayon	14	19,128	9	64	99	2,100
Motor vehicles	297	197,728	133	45	98	1,450
Locomotives	18	12,809	8	44	98	1,570
Smelting and refining zinc	28	11,289	24	85	98	460
Blast furnaces	122	29,188	105	86	98	270
Petroleum refining	359	65,324	224	62	97	285
Rubber tires and tubes	126	81,640	69	54	96	1,145
Steel works and rolling mills	473	370,726	317	67	95	1,120
Watches	13	13,915	7	54	95	1,890
Slaughtering and meat packing	1,269	120,422	329	26	92	335
Wool carpets and rugs	69	33,886	34	49	92	920
Cement	145	38,437	101	70	91	345
Motor vehicles, bodies and parts	1,358	228,382	148	11	91	1,280
Electric and steam railway cars	141	50,393	60	42	90	755

* Compiled from figures in *Biennial Census of Manufactures: 1925, Size of Establishments by Value of Product*, pp. 1222–1233.

† The census explains that "as a rule, the term 'establishment' signifies a single plant or factory. In some cases, however, it refers to two or more plants operated under a common ownership and located in the same city or state."

‡ The number of workers given is the average number for the year, secured by averaging the number of wage earners on the fifteenth of each month.

§ In columns III to VI, "large scale" refers to establishments with an annual product of a million dollars or more.

The table given above shows the industries in which at least nine-tenths of the workers are employed in establishments producing a yearly product of a million dollars or more. The list includes some

ɔllege professors, our

large products and some small products, many “nɛ ɜrs, and our account-
many industries in which chemical methods are im rained nurses, our so-
Conspicuous among the new industries are *moɩ* ·arians, and of course
most 200,000 workers, 98 per cent of whom work ɔns in which the sexes
factories, averaging 1,450 employees each; *rubber* ɜ entertainers and ar-

MANUFACTURES: CLASSIFIED ACCORDING good cases of an even
ESTABLISHMENT AS MEASURED BY THE
PRODUCTS, 1909, 1914, 1919, AND 1[illegible]
ΓABLISHMENTS[11]

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Value of Product and Year	I Establishments: Percentage of Total	I[I] Products: Percentage ... Total	[III]
Less than $5,000:			
1909	34.8	1.1	
1914	*	*	
1919	*	*	
1925	*	*	*
$5,000 and less than $20,000:			
1909	32.4	4.4	7.1
1914	49.0	3.7	6.1
1919	37.2	1.4	2.5
1925	29.8	1.0	1.9
$20,000 and less than $100,000:			
1909	21.3	12.3	16.5
1914	31.9	10.6	14.4
1919	35.3	5.6	8.6
1925	36.8	5.2	7.9
$100,000 and less than $1,000,000:			
1909	10.4	38.4	43.8
1914	16.9	36.5	43.5
1919	22.7	24.8	31.4
1925	27.7	26.3	33.5
$1,000,000 and over:			
1909	1.1	43.8	30.5
1914	2 1	49.2	35.9
1919	4.8	68.2	57.5
1925	5.6	67.6	56.8

* Establishments with a product of less than $5,000 a year were not enumerated in 1925, and have been omitted from the tables for 1914 and 1919. That means that the figures in column I for 1909 are not comparable with the figures for later years. The figures in columns II and III are very slightly affected since the proportion of product and of wage earners in establishments of the less than $5,000 group are seen to be such a small percentage of the total.

per cent of its 81,640 employees in 69 large scale factories averaging 1,145 employees, and *motor vehicle bodies and parts,* employing 87 per cent of its almost 200,000 workers in 148 large scale factories (only 11 per cent of the total number of establishments) averaging 1,280 workers. Partly stimulated by the growth of the automobile are other rapidly growing industries; *petroleum refining* and *cement manufacture,* employing respectively 97 and 90 per cent of their workers

... scale establishments. In both these cases, the million dollar ... represents a larger proportional investment in machinery and ...ent than in men, and so the average number of employees in ...e scale plants is not so large as in the automotive industries. ... new industry which has developed on a large scale is *rayon;* ... 99 per cent of the 20,000 workers in rayon mills were in large ...ants averaging almost $10,000,000 output and over 2,000 ...

The foregoing figures have been those of manufacturing business. However, the tendency to increase the size of the business unit and of group labor has not been confined to manufacturing establishments. Banks, department stores, mail order houses, insurance companies have gone through the same process of growth—until they too bring together large groups of people in one building, and still larger numbers under the same management, although in scattered groups. The Metropolitan Life Insurance Company employs 10,000 clerks in one building in New York City; the American Telegraph and Telephone Company payroll covers about 300,000 employees. Examples could be mutiplied, but it is clear that we have large scale establishments and resultant group labor in nearly all lines of activity.

7. FORMULA FOR AN EFFICIENT WORKMAN[12]

EFFICIENCY AND DEVELOPMENT OF THE INDIVIDUAL DEPENDS ON

A. Ability To Work
- I. Mental Efficiency
  - 1. Mental Equipment
    - *a*) Intelligence
    - *b*) Temperament
    - *c*) Schooling
    - *d*) Experience

    Proper Initial Selection
  - 2. Assignment
    - *a*) Job Specifications
    - *b*) Mental Examination
      Intelligence Test Interviews and Records
    - *c*) Standards of Output
    - **d*) Systems of Transfers
  - 3. Instruction
    - **a*) Task Instruction
      Motion Study, Instruction Cards Where Necessary

[12] Adapted from Boyd Fisher, "The Formula for an Efficient Workman," *Bulletin of the Taylor Society*, VI, No. 6 (December, 1921), 236. Starred items are considered as falling more especially under the production department.

b) Plant Instruction
   Systematic Routing, Rule Book, Bulletin Boards, Shop Paper, Safety Meetings, etc.
c) Trade Instruction
   Training School
d) General Education
   Textile Classes, Americanization, Dramatic Clubs, Glee Clubs, Literature, etc.

4. Supervision
   *a) Foreman
      Daily Assignment, Foreman Training
   b) Service Department
      Efficiency Record, Personal Contacts, Rating Cards

II. Physical Efficiency

1. Physical Development
   a) Physical Examination
   b) Athletics
2. Health
   a) Nurses' and Doctors' Work
   b) Health Education
   c) Fatigue Studies
   d) Posture and Seating
   e) Hygiene
   f) Recreation
   g) Nursery
   h) Dentistry
   i) Optical Work
   j) Specialized Medicine
3. Assignment
   a) Physical Classifications
   b) Job Classifications
   *c) Task Setting
4. Plant Conditions
   *a) Cleanliness and Sanitation
   *b) Humidity
   *c) Illumination
   *d) Heating
   *e) Ventilation
   f) Safety
5. Equipment
   *a) Good Machines
   *b) Proper Machine Setting
   *c) Good Tools
   *d) Mechanical Aids
   *e) Good Maintenance
   *f) Power and Transmission

6. Material
   *a) Right Material
   *b) Right Supplies
   *c) Raw Material on Time
      Routing, Scheduling, Internal Transportation
   *d) Supplies on time
      Central Stores, Balance of Stores
   *e) Traffic

B. Willingness To Work
  I. Conscious Will
    1. Discipline
      *a) Ratings
      *b) Rules and Penalties
      *c) Deductions for Spoiled Work
      d) Attendance Record
      *e) Discharge When Necessary
      *f) Transfer
    2. Enthusiasm
      a) Internal Publicity
      *b) Treatment
      *c) Good Running Work
      *d) Honestly Set Task
      *e) Payment
        Payment by Results, Living Wage
      *f) Promotion
      g) Organized Spirit of Rivalry and Good Will
        *Competitions, Records Posted, Rallies, Shop Paper
        *Good Supervision
      h) Suggestion System
      i) Shop Committee
      *j) Steady Work
  II. Unconscious Will
    1. Home Conditions
      a) Housing
      b) Community Work
      c) Mental Hygiene
    2. Treatment
      *a) Dignified Supervision
      b) Correct Payrolls
      c) Correct Time and Tally Keeping
      *d) Guaranteed Tasks
    3. Plant Conditions
      *a) Cleanliness and Sanitation
      *b) Humidity
      *c) Illumination
      *d) Heating

*e) Ventilation
f) Safety
4. Financial Incentives
a) Continuous Employment
b) Insurance Benefits
c) Realization of Promotions
d) Old Age Pensions

See also, "Securing and Maintaining an Effective Working Force," 655.

B. Position of the Worker as a Producer: Fears and Insecurities

In this part of our study we seek to understand the position of the worker in the present economic order. We wish to examine his ability to produce and his will to produce; we wish to secure a general idea of the effect of his way of making a living upon his life, although a more extended analysis of this problem will come later, in Part III.

As a result of the forces which have brought about the wage system of production, the modern worker has many reasons to congratulate himself on his better lot, as compared with that of earlier types of workers. He has better housing, better food, greater freedom of movement; he has less fear of local famines, less fear of the powers of nature, greater control of disease, and greater physical comfort; in many ways he is more secure.

But there are also elements of insecurity in his position, and his fears and uncertainties react upon both his ability and his willingness to produce, to say nothing of their reaction upon the other aspects of his life. As matters stand today, the dependent worker (who is our prime concern in this present discussion) is to a considerable extent subject to the risks and uncertainties of capital. If the position of capital is insecure, the worker will be insecure in his employment, and thus his livelihood is uncertain. Notwithstanding the fact that the entrepreneur serves as a sort of insurance concern for the worker, notwithstanding the fact that the large indirect costs of modern industry bring some pressure upon an employer to retain his workers longer than was the case under the domestic system, it still remains true as a

broad generalization that the worker is liable to suffer from the uncertainties in which capital and management find themselves. It matters not at all that the worker has had little, if any, part in bringing about the state of affairs which has caused these uncertainties.

And there are other uncertainties and disadvantages for the worker even when capital is quite secure. Industrial accident, occupational disease, fatigue, inadequate wage, inadequate opportunity are all possibilities, and in thousands of cases they become actualities. These uncertainties arise in part from the nature of the technical processes of modern industry; in part from the position in which the worker finds himself in industrial society; in part from individual fault; in part from inadequate and at times even hostile social control.

It may well be that many of the evils of his situation are not essential parts of a wage system. Professor Fetter has defined the wage system as "the organization of industry wherein some men, owning and directing capital, buy at their competitive value the services of men without capital." A moment's reflection will show that it is not an essential part of the wage system that the parties should be unequal in the competitive struggle.

The evils of the situation are countenanced by no one; both by individual initiative and by social control we look toward their elimination.

The following issues[12a] will point the way to a profitable reading of the selections in this section:

1. Wherein is the work contract a device for organizing to get done the work of an economic society?
2. What are the chief fears and insecurities of the worker in the present order?
3. In what respects does each of these fears and insecurities affect the productivity of our economic order?
4. In what respects do the social attitudes and outlooks which condition our economic order work against rapid elimination of those fears and insecurities which make for lessened productivity?

[12a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 126–31. (The University of Chicago Press.)

1. SECURITIES IN MODERN ACHIEVEMENTS AND METHODS[13]

Security of life.—One of the outstanding securities possessed by the worker today is a relative immunity from famine and disease. The wonderfully improved means of transportation have brought the products of the areas having a surplus to the very doors of the areas suffering from scarcity, and the no less marvelous improvements in medical knowledge have rendered the recurrence of the plagues of the Middle Ages unthinkable.

Security through participation in government.—Formerly government was in theory and fact the concern of the few. Today, although the actual functions of government are still exercised by a small group, the possession of the ballot by the worker is likely to make these rulers conscious of the fact that the power they hold is delegated. True, the worker may be characterized as both blind and somnambulant; yet he is a giant the possibility of whose awakening causes his interest to be treated cautiously and sometimes with solicitude.

Security through education.—Another security is seen in the universalizing of education. The worker's share in education has, to be sure, been limited by his occupational restrictions and confined largely to the more primary matters. But the ability to read and write has tended to limit his exploitation, and has afforded him some measure of self-expression and the means of co-operation with his fellows. Perhaps it is not making too strong a statement to say that education is the worker's greatest leverage for overcoming the handicaps imposed because of lack of property, family position, and control over the conditions of his employment.

Security through expanded production.—Contributing to the security of the worker is the technical efficiency of machine society in producing vast quantities of want-satisfying goods. But, someone may object, of what avail is it to increase the amount of consumable goods if population in industrial society tends to increase in the same or even in an accelerated ratio, or if the increase in the sum total of goods produced is not accompanied by corresponding improvement in the distribution of these goods to assure the worker a proper share in the potential comforts and pleasures which these goods represent? To

[13] Adapted from a statement prepared by Willard E. Atkins in Douglas, Hitchcock and Atkins, *The Worker in Modern Economic Society*, pp. 388–91.

the second objection, that unequal distribution may prevent the worker from sharing in the increased total of want-satisfying goods produced, it should be observed that such growing devices as inheritance and income taxes built upon a progressive base, the fast growth in city, state, and national concern for common access to education, playgrounds, art galleries, etc., and the assurance of certain minimums in wages, safety, and health—all tend to secure a direct distribution of wealth upon a more equal basis or to distribute it indirectly by making the more fortunate pay the costs of providing through state activities for the welfare of the mass.

Security through mass action.—Additional security is gradually becoming a fact through the campaigns to prevent accident, stabilize employment, and, where a loss cannot be avoided, to meet it through various systems of insurance whereby the direct or indirect difficulty of the individual is provided for by contributions from the mass. Under this heading can be suggested campaigns like the "safety first" movement, legislation providing safeguards for workers, studies in the prevention of unemployment and occupational disease, and various forms of insurance to meet the burden of ills which cannot be prevented which include various forms of insurance against accidents, unemployment, dependent old age, sickness and occupational disease.

Security through class consciousness.—These securities of mass action have been greatly abetted by class consciousness. It is the recognition of the solidarity of class interest which has made large groups of organized workers willing to contribute to the support of smaller local groups or isolated individuals which may be dependent for example, because of strikes, sickness, death, or unemployment.

Security through ethical standards.—Modern workmen appear to be more secure through the development of ethical standards. It is true that the earlier era of concentrated, impersonal machine industry destroyed both the claim on the employer and the claim on the community which the manorial worker possessed. Spontaneous aid to a sufferer has become less easy in the sharply competitive and commercial city. Yet the power of the state is gradually being evoked to protect women and children, and workers in extra-hazardous occupations. Housing programs and regulations, free libraries and clinics, all point toward the increasing socialization of property. Codes of pro-

fessional ethics have been developed to safeguard particularly the less fortunate from the prosecutions of shyster lawyers, the purveyor of fraudulent securities, and the medical quack. Growing respect for human beings as human beings has been reflected in the appeals for guaranties of minimum standards of living, the breaking of caste barriers to education, the abrogation of cruel and unusual punishment, and theories and procedures designed to secure to all equality before the law.

Security through method and spirit of science.—Finally it may be said that underlying all these securities of the modern worker is the scientific method itself, the method of fearless investigation and application which assumes that all phenomena lie within the sphere of man's potential knowledge and possible control. The multitude of ways in which man's control over his environment has been extended have all tended toward the breakdown of taboo and to the realization of the inherent assumption of science that nothing is too sacred or too difficult to be subjected to man's intelligence. Man has passed first through the period wherein he, like other animals, appropriated the things which nature furnished, then through the period in which he adapted the things of nature to his own use, and finally he is at the threshold of the period wherein he knows he can and he is molding "an artificial world nearer to his heart's desire. Creative evolution is at last becoming conscious." With it all the worker is promised a security beyond anything which he has yet attained.

2. THE FEARS OF LABOR AND OF CAPITAL[14]

In the process of Industry, the unwillingness of individual parties to put forth their utmost effort may arise from defects of character, inadequacy of training, or lack of opportunity. Where opportunity, training, and capacity are present, failure to realize the best in effort arises mostly from the fear that one or other of the parties will put forth a less than proportionate share of effort, or claim a more than proportionate share of reward.

The fears which circumscribe the freedom of effort of Capital, Management, and the Community are by no means so real or consid-

[14] Adapted from W. L. M. King, *Industry and Humanity*, pp. 234–43 (1918). By permission of and arrangement with Houghton Mifflin Company.

erable as those which surround Labor. They differ, also, in that they represent consequences much less serious to human life.

Capital can wait for its reward. Capital, moreover, is free to move about. If not required in a particular locality or business, it readily finds investment in some other place or enterprise. Labor is not so mobile. It is confined in a thousand and one ways. It is necessarily largely restricted to occupations to which it has been trained. It is more or less rooted to localities which speak of home and its associations. It is largely ignorant of the world without. Capital is a citizen of the world, with no definite occupation or home. It suffers little from fears of isolated position, substitution, dismissal, arbitrary and unjust treatment. Such risks as it runs are very largely its own. How vastly different is life to its possessor under such circumstances!

It is the fear of unemployment which lies at the root of most of the minor fears which Labor entertains. The fear of unemployment is in reality the fear on the part of Labor that capital will not be provided to carry on industry continuously, and under conditions which will afford adequate remuneration to effort. It is an outgrowth of the fallacy that quantity of work is necessarily limited. This fear gives rise to the fear that the introduction of new machinery, or the increased use of machinery already installed, will displace labor; the fear that speeding-up processes will diminish work; the fear that female, child, unskilled, or imported labor will be substituted for skilled; the fear that men of one trade will encroach upon the work for which men of other trades have been specially trained; the fear that the number of apprentices will be so increased as to lessen the requirement for skilled hands; and the fear that long hours and continuous overtime will exhaust employment.

Allied to the fear of unemployment is a class of fears which, as seen, have a special bearing on industrial peace: the fear of discharge and of unfair treatment through the utter helplessness of the isolated workman in relation to the capitalist employer, and, still more, in relation to a powerful corporation; the fear of lockouts or arbitrary exactions, and the many years incident to tyrannical and capricious behavior on the part of those in authority, and especially of subordinate officials toward workers under their direction. This fear extends to the power of wealth to defeat the ends of justice, by corrupting offi-

cials and influencing or controlling the judiciary and legislatures, and to the influence also of a class interest and sentiment on the part of the monied classes as distinguished from the working classes. With it are allied the many fears which have a special bearing on health in Industry: fears, for example, of physical injury and ill-health, and of inadequacy of compensation or redress when injury is done.

Arising from the worker's sense of utter helplessness is also the fear, apart from combination, of the absence of any voice in determining the contract on which services are given, and the fear, in consequence, of unfair terms in bargaining and in determining the rate of remuneration, the hours of labor, and working conditions. This extends to the fear of reductions in standards already gained; the fear of individual or general reductions in wages, of increase in hours, of change in customary practices; the fear of resistance on the part of employers to combination; and the fear of methods intended to destroy or weaken organization. Whatever begets fear of opposition to organization helps to intensify other fears.

Beset by fears at once so numerous and constant, it must be apparent that Labor is in no way capable of putting forth effort to the utmost of its capacity. Where the mind is in a state of unrest, the arm is divested of some of its power, and the hand of some of its skill. Time which otherwise might be freely employed in furthering production, with benefit in opportunity and reward to all the parties to Industry, is consumed in effecting organization against ills that are feared, or in agitation concerning their existence.

Whilst less serious in their immediate personal consequences than the fears which Labor endures at the instance of Capital, the fears which Capital experiences at the instance of Labor are by no means inconsiderable or unreal. What these fears are is well known; they have received heightened emphasis under the stress of war. The source of all is the fear that Labor will not be provided in quantity and quality sufficient to carry on Industry continuously, and under conditions which will afford adequate remuneration to investment. Foremost is the fear of strikes, and their consequences. If Labor refuses to work, Capital and Management likewise become idle, unless transferred to other industries. Transfer, however, is not always possible. Capital investment in Industry is partly "fixed" in plant and equipment; and

markets, as well as Labor, have to be found for the output of new enterprises. Management, too, becomes identified with particular classes of business, and new openings are not always at hand.

Allied to the fear of strikes is the fear of labor combination, and its attempts to control the labor market, and to restrict output. This fear has greatly increased with the augmentation of Labor's power consequent upon extensive organization and the growth of class consciousness. The obnoxious restrictions are all in the nature of limitations upon the freedom of initiative and power of direction, usually of the employer, but sometimes also of the workman. Briefly classified, restrictions of the kind include such practices as hampering the installation of the best machinery, or the speed at which it is worked; preventing the introduction of new processes; limiting the freedom to engage, or to promote, or to put at any kind of work, any workman, irrespective of training, age, or sex. Among such restrictions are also to be included the limitation in numbers of apprentices; the insistence on trade unionism and employment of union labor to the exclusion of any other; the demarcation of employment; the requirement of a minimum wage; the objection to systems of remuneration by piece work or bonus systems; and restrictions in hours of work, and the prohibition of overtime.

Analogous to the class of fears begotten of labor control and restricted output, are the fears that "discipline," as it is termed, will be interfered with; that employers will not be free to dispense with the services of undesirable, incompetent, or unnecessary workmen without risking a cessation of work; and that disputes cannot be adjusted except in accordance with methods prescribed by organizations to which workmen belong.

The fear that Labor can be secured, so to speak, only on its own terms, which may involve exorbitant demands as respects hours, wages, and working conditions, is supplemented by the fear that even where a contract is entered into, with precise stipulations, its provisions may not be lived up to. There is the fear also that one concession may be used to force another, and that arbitrary exactions of many kinds may be attempted.

Finally, there is the class of fears associated with extreme measures, with revolutionary movements, and with violence, as, for exam-

ple, the boycott, sabotage, revolutionary socialism, revolutionary syndicalism, the I.W.W.'s, and all forms of anarchy.

3. INDUSTRIAL ACCIDENTS AND DISEASE

A. THE HAZARDOUS NATURE OF MODERN INDUSTRY[15]

In the first place, a high degree of hazard inheres in present-day methods of production. Modern technology makes use of the most subtle and resistless forces of nature—forces whose powers of destruction when they escape control are fully commensurate with their beneficent potency when kept in command. Moreover, these forces operate, not the simple hand tools of other days, but a maze of complicated machinery which the individual workman can neither comprehend nor control, but to the movements of which his own motions must closely conform in rate, range, and direction. Nor is the worker's danger confined to the task in which he is himself engaged, nor to the appliances within his vision. A multitude of separate operations are combined into one comprehensive mechanical process, the successful consummation of which requires the co-operation of thousands of operatives and of countless pieces of apparatus in such close interdependence that a hidden defect of even a minor part, or a momentary lapse of memory or of attention by a single individual may imperil the lives of hundreds. A tower man misinterprets an order, or a brittle rail gives way, and a train loaded with human freight dashes to destruction. A miner tamps his "shot" with slack, and dust explosion wipes out a score of lives. A steel beam yields to the pressure it was calculated to bear, and a rising skyscraper collapses in consequence, burying a small army of workmen in the ruins.

In the second place, human nature, inherited from generations that knew not the machine, is imperfectly fitted for the strain put upon it by mechanical industry. Safely to perform their work the operatives of a modern mill, mine, or railway should think consistently in terms of those mechanical laws to which alone present-day industrial processes are amenable. They should respond automatically to the most varied mechanical exigencies, and should be as insensible to fatigue and as unvarying in behavior as the machines they operate.

[15] Adapted by permission from E. H. Downey, *History of Work Accident Indemnity in Iowa*, pp. 3–5. (Published by the State Historical Society of Iowa, 1912.)

Manifestly these are qualities which normal human beings do not possess in anything like the requisite degree. The common man is neither an automaton nor an animated slide-rule.

The machine technology, in fact, covers so small a fraction of the life history of mankind that its discipline has not yet produced a mechanically standardized race, even in those communities and classes that are industrially most advanced. And so there is a great number of work injuries due to the "negligence of the injured workman"—due, that is to say, to the shortcomings of human nature as measured by the standards of the mechanician.

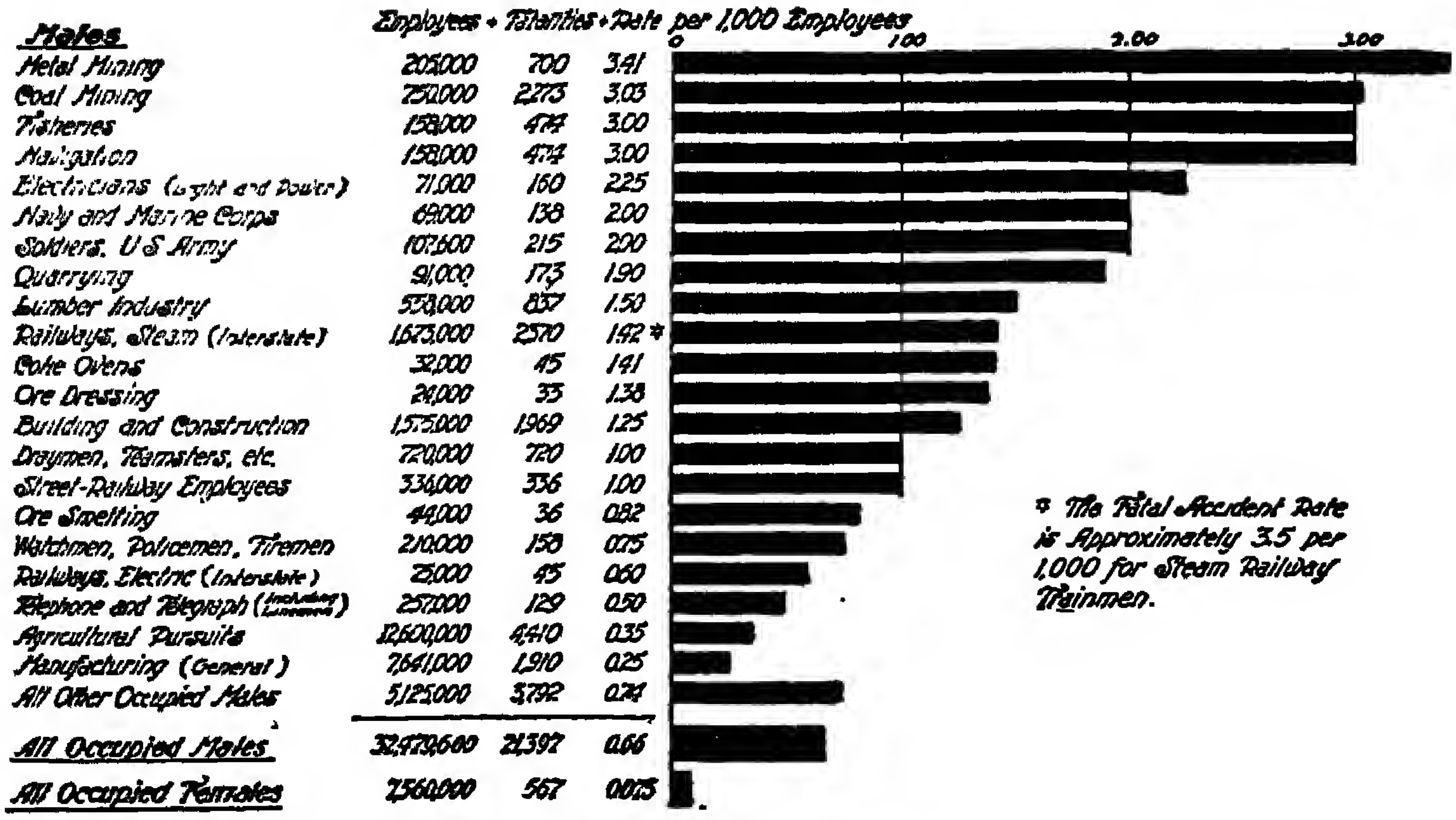
See also "Some Consequences of the New Technology," page 554.

B. CAUSES AND EXTENT OF INDUSTRIAL ACCIDENTS[16]

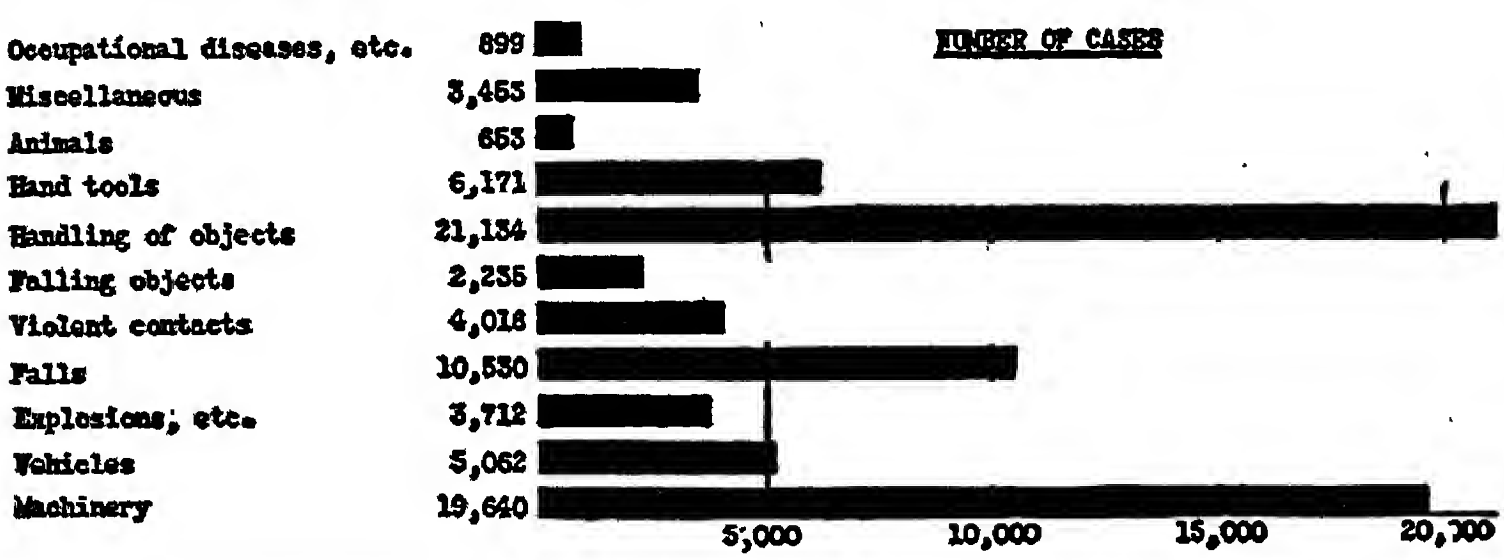
It is estimated that there are 21,232 fatal accidents and a total of 2,453,418 industrial accidents in industry in the United States each year. In 1922, over 500,000 accidents were so serious that the injured workers each lost four weeks or more; and over 1,000,000 accidents caused a loss of at least two weeks each. The time lost because of injury and death through industrial accidents is estimated to be 227,169,970 man-days per year, counting death or permanent disability as a loss of 6,000 days. If the earnings of these workmen averaged four dollars and a half per day, the loss in wages would amount to $1,022,264,806, to say nothing of the cost of medical care and of loss of efficiency. If one were to seek to compute the total cost, he would include such items as the cost of idle machinery and idle plant space and of training new workers to replace the workers killed or disabled by accidents—and the worker's expenditures for hospital bills, medical and surgical care.

Mining, fishing, stevedoring, lumbering, railroading, and building construction are the dangerous occupations; agriculture and "general manufacturing," the least dangerous. Occupations of men are, on the whole, 8.4 times as hazardous as those of women.

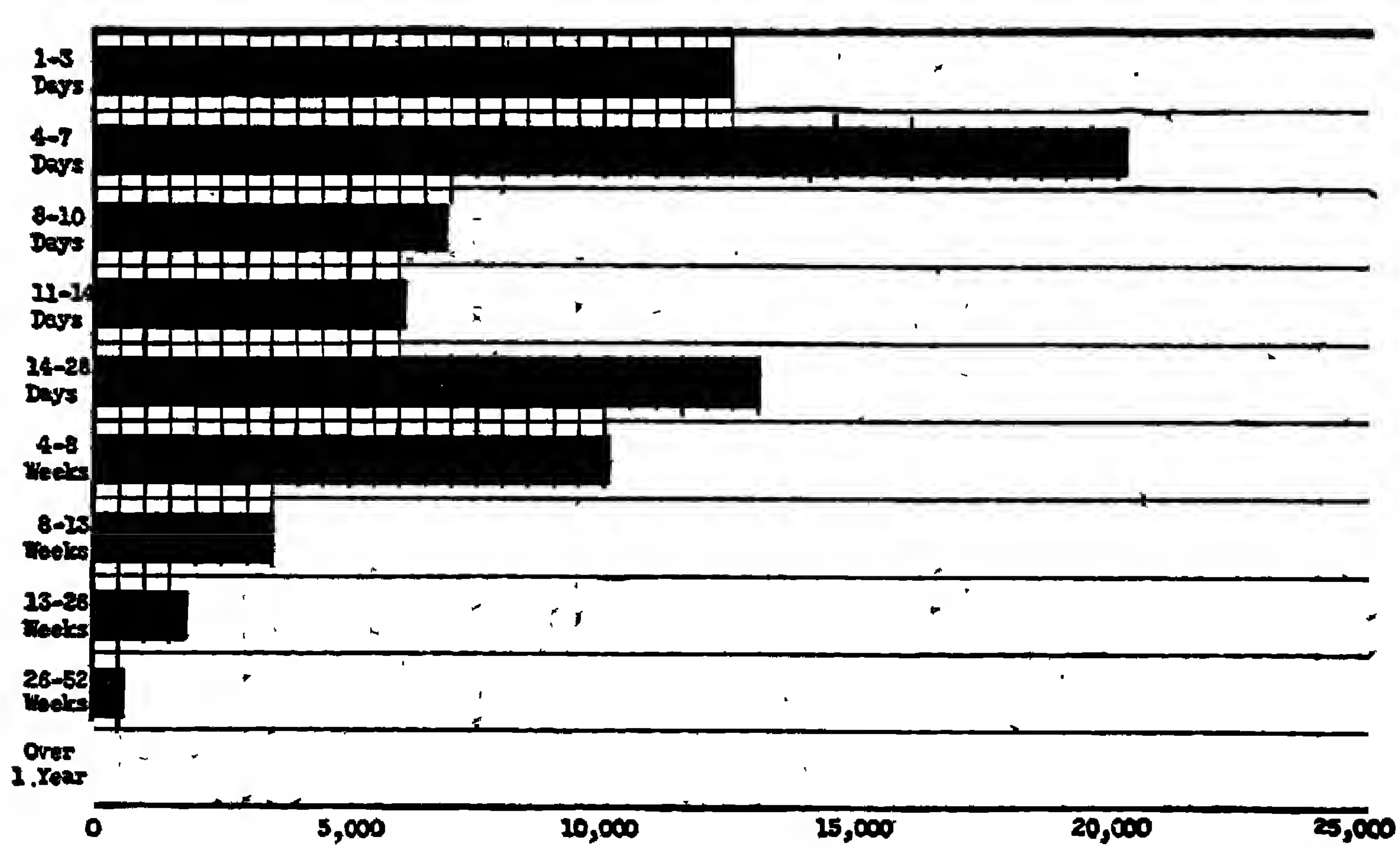
[16] Adapted from Wiese and Reticker, *The Modern Worker* (1929). Reprinted by permission of The Macmillan Company, publishers.



ESTIMATE OF FATAL INDUSTRIAL ACCIDENTS FOR THE UNITED STATES FOR ONE YEAR



DISTRIBUTION OF INJURIES (A MASSACHUSETTS STUDY)



DURATION OF DISABILITY IN CASES OF TEMPORARY TOTAL DISABILITY

The length of time the worker is disabled is always a matter of serious concern. The graph shows the experience of Massachusetts as reported by the Industrial Accident Board.

It is clear that accident losses are so great that every one concerned should take steps to reduce these hazards of modern industry. Obviously, knowledge of the causes of accidents is the first step in a program for reducing them. The cases reported in New York State (New York has more complete records than have other states) in the year ended June 30, 1927, are divided into eight groups: handling objects, falls, machinery, vehicles, hand tools, falling objects, explosions and hoisting apparatus. More than one quarter (27,000) of all accidents for which compensation was paid were due to handling objects—heavy or bulky objects, sharp or rough objects, hand trucks, carts and wheel barrows.

Behind the direct causes cited in these diagrams are often other indirect causes. Bad factory housekeeping results in dark stairways and gangways, unprotected elevator shafts, wet floors, broken steps, loose articles left around on floors or shelves, unprotected wheels, gears and belts. Then, too, psychological factors enter into accidents; a toothache, or headache, worry over illness at home, haste, the recklessness of youth, or an emotional upset because of a worker's resentment of a reprimand may be the underlying cause of an accident. Inexperience is another prolific source of accidents. New employees (those having less than one month's service) are six times as liable to have accidents as those who have been on the job over one month. In the case of some workers, inexperience is intensified by ignorance of the language. A large steel company found that its non-English speaking workers suffered accidents two and three-tenths as often and one and four-tenths as severe as the English speaking workers. The American temperament is blamed for accidents by some observers who feel that recklessness is part of the American creed.

C. OCCUPATIONAL DISEASES[17]

Besides the danger of injury from machinery and from general insanitary conditions, there are certain specially dangerous or injurious trades, in which injury by poisoning, disease, etc., is incidental to trade processes as at present conducted. Mr. William English Walling, formerly a factory inspector in Illinois, in a paper read before the Convention of Factory Inspectors in 1900, classified these dangerous trades as follows:

[17] Adapted from *Final Report of the Industrial Commission*, 1902, XIX, 901–2.

1. Trades in which lead is a poisonous element: the manufacture of earthenware and china; file cutting; the manufacture of white lead; lead smelting; the use of lead in print or dye works; the manufacture of red, orange, or yellow lead; glass polishing, enameling of iron plates; enameling and tinning of hollow metal and cooking utensils; processes in which yellow chromate of lead is made, or in which goods dyed with it undergo the process of building, winding, weaving, etc.

2. Trades which produce other chemical poisons: manufacture of paint and color; extraction of arsenic; dry cleaning; paper staining, coloring, and enameling; hatters' and furriers' work; the manufacture of matches; chemical works; bronzing and metallochrome powder in lithographic works; india-rubber work; dyeing with certain dyes; mixing and casting of brass, gun metal, bell metal, white metal, phosphor-bronze, and manila mixture.

3. Trades in which anthrax or lockjaw is an incident: wool sorting; the handling of hides and skins; hair factories; brush making; bone factories; fellmongers' works; furriers' works; tanneries; wool combing; blanket stoving and tentering; warp dressing; carbonizing and grinding of rags; flock making; feather cleaning.

4. Trades in which the danger arises from injurious particles in the air, or from dust: basic slag works; manufacture of silicate of cotton; file cutting; flour mills; trades which use grindstones or emery wheels; china scouring; silk combing; flax scutching.

5. Trades in which accidents are so frequent as to demand special legislation: metal works which use converters; electrical generating works; bottling and bottle testing; quarries; manufacture of salt.

6. Processes which require a sudden change from great heat to cold, and vice versa: lacquering and japanning; galvanizing of iron, work carried on in furnaces and foundries.

7. Processes that require artificial humidity: cotton spinning, weaving, etc.; flax spinning, weaving, etc.; wool spinning; silk spinning.

As an example of disease resulting from poisoning may be mentioned plumbism, the disease caused by inhaling particles of lead. One of its first symptoms is a blue gum, followed by loosening and dropping out of the teeth. Blindness, paralysis, and death in convulsions

often follow. Besides plumbism, there are serious indirect results from lead poisoning in a number of different occupations.

[Note.—*Bulletin 306 of the United States Bureau of Labor Statistics* makes the following list of industrial hazards: (1) abnormalities of temperature, (2) compressed air, (3) dampness, (4) dust, (5) extreme light, (6) infections, (7) poor illumination, (8) repeated motion, pressure, shock, etc., (9) poisons.]

Preventive measures.[18]—A large amount of the unnecessary sicknesses and premature deaths may be prevented with comparatively little effort or cost on the part of the employer. Many occupational diseases may be prevented by:

(1) Securing the scientific ventilation of workrooms, especially by the installation of efficient local exhausts which remove dust at points of generation. In some industries, such as in smelting and refining, fountain-pen-point manufacturing, jewelry, etc., the dust created is valuable, and it has been found profitable to recover the valuable material from the collected dust by means of a patented electrical precipitation process.

(2) Securing cleanliness by providing ample washing or bathing facilities. Some plants provide separate lockers for street clothing and working clothing, so arranged that the worker must remove his working clothes, hang them up to dry or place them in the lockers, and must then pass through the shower room before he can get to his locker containing street clothing.

(3) Wearing of proper protective clothing, viz., respirators and goggles in dusty processes which cannot be taken care of by exhaust ventilation, as in sand-blasting and emery-wheel grinding; boots and gloves in wet and chemical processes; special shoes for foundry workers; helmets for welders; water-cooled furnace doors for hot-process workers; overalls, aprons, caps, etc.

(4) Shortening the working hours (and, therefore, the period of exposure), allowing rest or "spell" periods in fatiguing and exhausting work.

(5) Requiring physical examinations at entrance, to weed out those unfit for work and to place others where they are best suited

[18] Taken by permission from L. K. Frankel and Alexander Fleisher, *The Human Factor in Industry*, pp. 142–44. (The Macmillan Co., 1920.)

physically; and periodically to ascertain whether workers are suffering from the effects of their occupations so that changes may be made and treatment or necessary advice given.

(6) Providing medical care, including first aid and necessary subsequent treatment.

(7) Giving health instruction and safety education.

(8) Proper layout of plant and good housekeeping so that workers in one process are not unnecessarily exposed to the hazards of another adjacent process.

(9) Sanitation of plant to prevent the spreading of communicable diseases. This includes adequate and proper toilet facilities, sanitary bubbling fountains, individual towels, spittoons, etc.

See also "Accident Prevention," page 665.

D. FATIGUE[19]

1. Fatigue—the most common and subtle danger of occupation:
   a) It may be regarded as a chemical process—a continual tearing down of muscle and nerve tissues without building them up.
   b) In this way, fatigue substances or toxins come to circulate in the blood, poisoning brain and nervous system, muscles, glands, and other organs: When blood is transferred from an exhausted dog to a frisky one, the latter immediately droops and shows all the signs of fatigue.
2. Objective causes of fatigue:
   a) Long hours—in the steel industry, the working day is usually twelve hours, seven days in the week.
   b) Monotonous, speeded-up operations—at many machines a quick pressure of the foot and accompanying hand-movements are repeated "40 times a minute, 24,000 times a day."
3. Results of fatigue:
   a) Fatigue and industrial inefficiency—poorer work and less work is done in the last hours of a day's labor than in the earlier hours.

[19] Taken by permission from E. S. Bogardus, *An Introduction to the Social Sciences*, pp. 44–45. (University of Southern California, 1913. Author's copyright.)

b) Fatigue and contagious diseases—an overworked laboring man or woman is more susceptible to pneumonia, tuberculosis, typhoid fever, than is a person whose vital resistance is normal. A typical succession of events is first, fatigue, then colds, then tuberculosis, then death.

c) Fatigue and nervous diseases—long hours of labor and feverish haste lead to nervous breakdown.

d) Fatigue and future generations—the children of overworked parents tend to be physical weaklings.

e) Fatigue and morals of working people—long hours of monotonous labor increase the susceptibility of the human organism to harmful temptations. The exhausted worker tends to neglect all family duties.

f) Fatigue and industrial accidents—the liability to accident increases with the daily hours of labor.

See also "Conditions of Work," page 662.

4. UNEMPLOYMENT

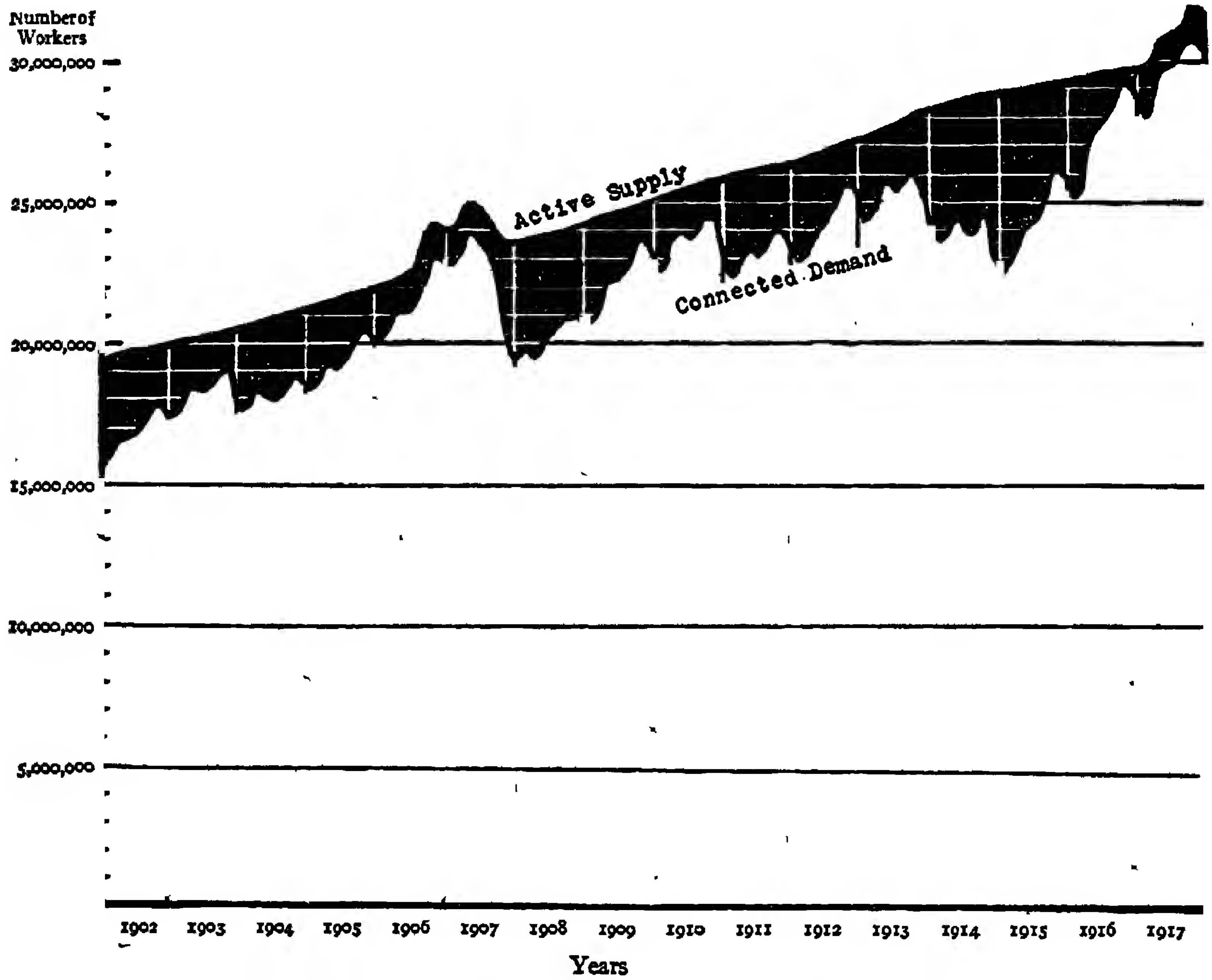
A. THE AMOUNT OF UNEMPLOYMENT[20]

On these facts [testimony of employers and workmen, data with regard to the number of unemployed at relief agencies and the number of applicants at employment offices, data from censuses and special investigations, trade-union statistics, etc.] we base our statement that at all times of the year in every industrial center of the State able-bodied men are forced to remain idle though willing to work. On any given day during the year at least 3 per cent of our wage-earners are involuntarily idle. Usually there are 10 per cent. These idle men must always be on hand to meet the fluctuating demands of the industries of the State.

Summarizing the data at our command, we should say that in ordinary years of business prosperity, taking all industries into consideration, out of every 100 persons, 60 will be steadily employed; 40

[20] From the *New York State Commission on Employers' Liability and Unemployment, Report of Committee on Unemployment,* 1911, pp. 38, 53–54.

will be working irregularly. Of those who have irregular employment 3 will always be out of work. The percentages vary with the different industries, but the experience is characteristic of every industry.



FLUCTUATIONS OF UNEMPLOYMENT IN NON-AGRICULTURAL OCCUPATIONS IN THE UNITED STATES, 1902–17

(Each black oblong represents one million workers unemployed one year)

A study of the chart[21] brings out striking facts. First, the number of unemployed in cities of the United States (entirely omitting agricultural labor, for which no reliable data are now available) has fluctuated between 1,000,000 and 6,000,000. The least unemployment occurred in 1906–1907, and 1916–1917, while the most occurred in 1908 and in 1914 and 1915.

[21] Taken with permission from Hornell Hart, *Unemployment in the United States, 1902–17*, Helen S. Trounstine Foundation, Cincinnati, Ohio, pp. 48, 51–53.

B. DIAGRAM OF CAUSES OF UNEMPLOYMENT[22]

- Regular Causes of Unemployment
  - Casual nature of certain trades
  - Repair of works
  - Climatic changes
  - Habitual changes of fashion
  - Reserves of labour round industrial establishments
  - Lack of proper organization in factories resulting in anarchic methods of hiring and firing workmen
- Irregular Causes of Unemployment
  - Uncertainties in Political Life
    - War
    - Changes in legislation bearing on economic activities
    - Irregularities of public works
  - Variations in Nature
    - Famines: Agricultural or other disasters
    - Earthquakes
    - Storms at sea (affecting dock labour)
  - Variations in the Comparative Attractiveness of Investments
    - Invention of new machinery
    - Improvement in industrial organization
    - Removal or displacement of an industry
    - Change of routes, of means of communication, and of tariffs
    - Alteration of waterways to the interior
    - Long time changes of fashion
    - Sudden immigration of workmen: a temporary flow of workmen towards a given industry or towards a given centre
    - Involuntary closing of factories
    - Changes in money value. Price fluctuations
    - Abuses of competition and speculation
    - Sweating system and abuse of employment of women and children
    - Excessive prolongation of the hours of labour
    - A crisis abroad or a change in the market of some other country
    - Changes in foreign competition and production

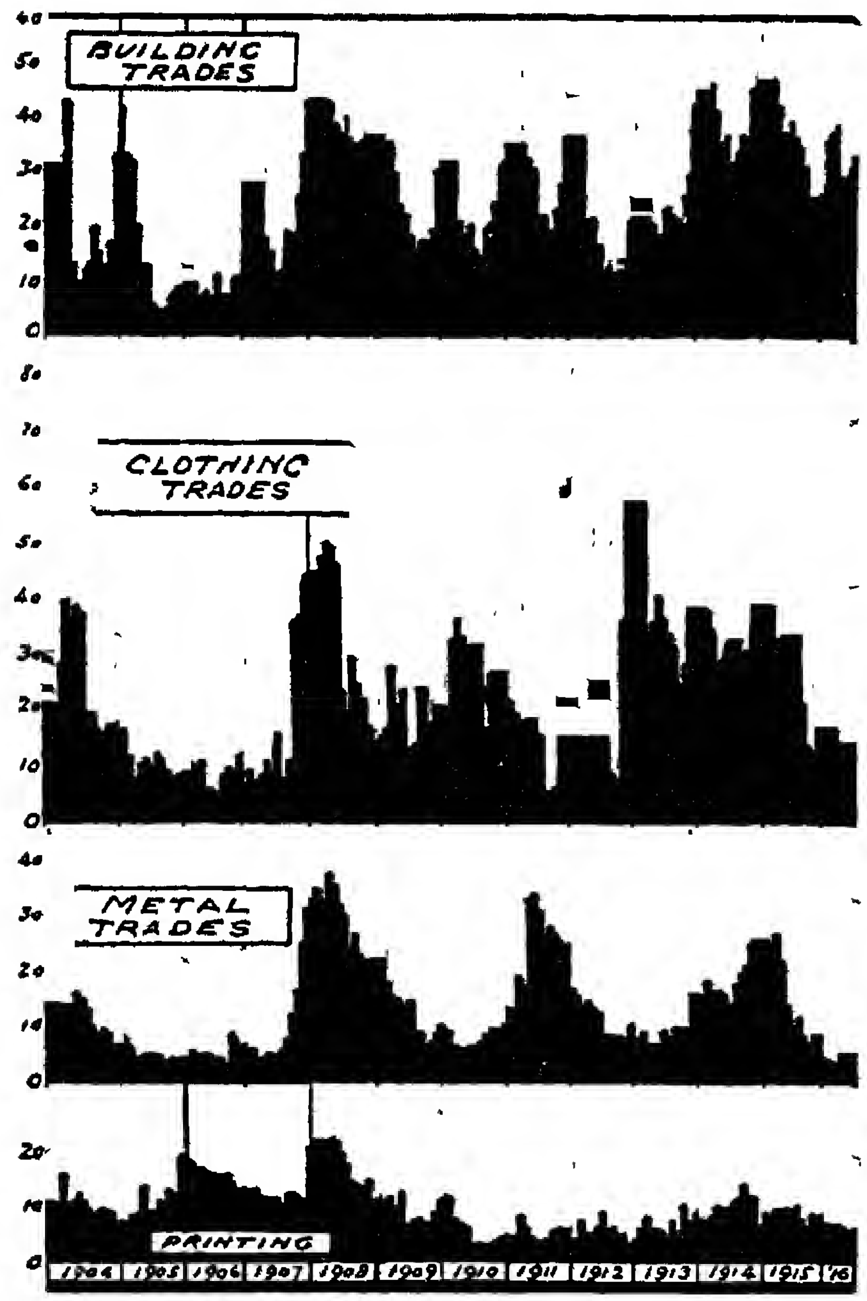
C. DISCUSSION OF CAUSES OF UNEMPLOYMENT[23]

The problem of unemployment is the problem of the adjustment of the supply of labour and the demand for labour. The supply of labour in a country is, in the widest sense, the supply of population. It is at any moment, apart from the possibilities of emigration and immigration, a fairly fixed quantity. Moreover, it is fixed for each moment, not by anything then happening, but by the habits and actions of millions of disconnected households a generation back. The demand for labour, on the other hand, is an aggregate of thousands or tens of thousands of separate demands in the present. It fluctuated with the fortunes and the calculations of the host of rival employers.

[22] Adapted with permission from Joseph L. Cohen, *Insurance against Unemployment*, p. 30. (P. S. King & Son, Ltd., 1921.)

[23] Adapted by permission from W. H. Beveridge, *Unemployment*, pp. 4–13, 81, 114. (Longmans, Green & Co., 1910.)

Discrepancy between two things so distinct in immediate origin is obviously possible. The problem has merely to be stated in order to shatter the simple faith that at all times any man who really wants work can obtain it. There is nothing in the existing industrial order to secure this miraculously perfect adjustment.



N. Y. State Industrial Comm. Bull. 85

Percentages of Unemployment of Organized Wage-Earners in New York

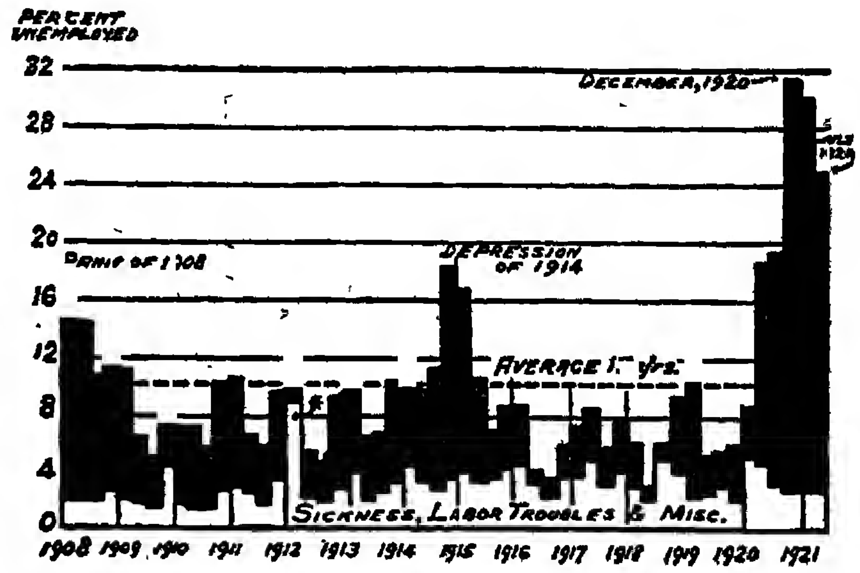
Unemployment is not to be explained away as the idleness of the unemployable. As little can it be treated as a collection of accidents to individual work-people or individual firms. It is too widespread and too enduring for that. There are specific imperfections of adjustment which are the economic causes of unemployment.

One of these has long been recognized. While industry, as a whole, grows, specific trades may decay, or change in methods and organization. The men who have learned to live by those trades may find their peculiar and hard-won skill a drug on the market and themselves permanently displaced from their chosen occupations, while lacking both the youth and the knowledge to make their way into new occupations.

A second type of maladjustment between the demand for and the supply of labour is found in actual fluctuations of industrial activity. Many trades, perhaps most trades, pass regularly each year through an alternation of busy and slack seasons, determined by climate or social habits, or a combination of both. Building is slack in winter and busy in spring and summer. Printers find least to do in the August holidays and most in the season just before Christmas. At the London

docks timber comes in at one time of the year; fruit at another; tea at a third. Behind and apart from these seasonable vicissitudes of special trades, and affecting, though in varying degrees, nearly all trades at about the same time, is a cyclical fluctuation in which periods of general depression—1868, 1879, 1885–1886, 1893–1895, 1904—alternate at irregular intervals with periods of feverish activity—1872–1874, 1881, 1889–1890, 1899–1900.

These two elements in the problem of unemployment have long been familiar. A third, apparently far more important than either the occasional transformation of industrial structure or the periodic fluctuations of industrial activity, is only just beginning to receive attention. This is the requirement in each trade of reserves of labour to meet the fluctuations of work incidental even to years of prosperity.



The Commonwealth of Massachusetts
Dept. of Labor & Industries
Division of Statistics

FLUCTUATIONS IN UNEMPLOYMENT IN MASSACHUSETTS, 1908–21

Percentages of organized wage-earners unemployed at end of each quarter. The shaded portions of the chart represent unemployment due to lack of work or material.

* Strike

Changes of industrial structure are constantly occurring and constantly throwing men out of employment. The very life and growth of industry consist in the replacement of old machines by new; of established processes by better ones; of labour in one form and combination by labour in fresh forms or fresh combinations. The demand for labour is thus in a state of perpetual flux and reconstruction both as to quality and as to quantity.

The changes which may have this effect are very various. Each indeed is so far individual and specific as to make exhaustive description impossible. All that can be done is to note the main types.

First, while the industry of the country as a whole grows, particular industries or forms of production may decay.

Second, an industry may be transformed by the introduction of

new processes or new machines. From this point of view the lace trade is particularly interesting.

Third, perhaps as an accompaniment of new processes or machines one type of labour may be substituted for another. Thus, in boot making, where the number of persons employed remains, in spite of the increased total population, practically the same in 1901 as in 1891, there has been, according to the census, not only a substitution of machine work for hand work, but also of females for males, and of younger for older males.

Fourth, the chief seat of an industry may shift from one part of the country to another. This, as in the instance of the lace trade mentioned above, may happen as the accompaniment of other changes. Sometimes—as in the removal of the main shipbuilding centres of the country from south to north—it may be independent of them.

See also "The Machine and the Laborer," page 562.

D. THE NEED FOR UNEMPLOYMENT[24]

The need for unemployment focuses around nine points, as follows:

1. The need of industries to select suitable applicants from among the candidates who present themselves, and to reject the unsuitable.

2. The need of workers to explore the market in order to find the place in which they can be most useful and most happy.

3. The need of being able to launch new enterprises without actually pulling away too many men who are already working in established industries.

4. The need—if it really exists—of the fear of losing the job as an incentive to make labor put forth as much effort as industry has a right to demand.

5. The need—if it exists—of strikes, to protect labor's legitimate interests, or of a replacement force in case of strikes, sufficient to prevent the community from being at the mercy of organized labor, but

[24] Adapted from J. M. Clark, *Studies in the Economics of Overhead Costs*, pp. 366–67. (The University of Chicago, 1923.)

not sufficient to put labor at the mercy of the cut-throat competition of unemployed workers who must take anything they can get.

6. Workers must have moved about from trade to trade in the process of acquiring trade knowledge, and this involves some necessary unemployment, though possibly no more than is already implied in laborers finding the place to which they are best fitted.

7. The need of a supply of labor to handle seasonal peaks and other incidental irregularities in particular industries. Here one must distinguish carefully between the need of some unemployment and the need of throwing upon labor the burden of financing it. The two are separate questions.

8. The need of a reserve to handle the peak of the business cycle. Here again, what industry feels as a need is to have this reserve without paying for its upkeep during the idle times.

9. The need of throwing upon labor a part, at least, of the burden of dovetailing together seasonal occupations and finding work in dull times, (*a*) to stimulate laborers to do their best in this direction and to make some concessions in order to utilize their own idle overhead, and (*b*) to relieve industry of a financial burden which it could not easily bear, and of the necessity of regularizing employment to a greater extent than it now finds practicable.

E. EFFECTS OF UNEMPLOYMENT[25]

1. *Lessened income.*—Unsteady employment affects wages in three ways: "It reduces the amount of the workmen's earnings; it causes irregularity of income; and it decreases his efficiency." Whether unemployment is as important as sickness in causing the breakdown of family independence is a disputed question; nevertheless, it plays a great rôle in family demoralization.

Lescohier cites an investigation in Connecticut which showed that the actual earnings of employees in different industries fell from 13 per cent to 18 per cent below full-time earnings. In New York 62.1 per cent of the paper-box workers and 63.4 per cent of the confectionery workers fell more than 10 per cent below full-time earnings.

2. *Destruction of the worker's efficiency.*—As Lescohier has so

[25] Adapted with permission from John L. Gillin, *Poverty and Dependency*, pp. 467–70. (Century Co., 1921.)

well said of the worker, unemployment destroys his capacity for continuous consistent endeavor; saps self-respect and the sense of responsibility; impairs technical skill; creates a tendency to blame others for his failures; prevents thrift and hope of family advancement; sends him to work worried and underfed.

3. *Effects on the family.*—It forces the mother out of the home to supplement the earnings of the man; it takes children from school at the earliest possible moment and places them in industry. It forces the family to move into poorer quarters.

4. *Industrial and political unrest.*—The unemployed man feels that in unemployment he has one more cause of complaint against the industrial order.

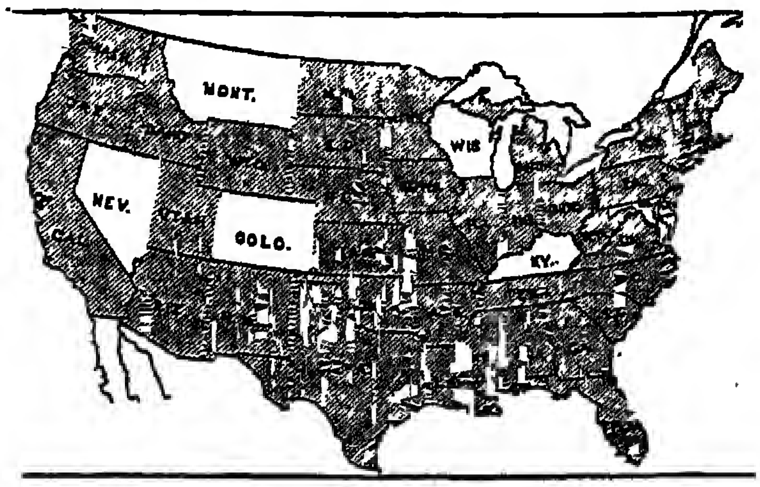
5. *Social demoralization.*—The moral standards of the unemployed man are impaired by spells of idleness; time lies heavy upon his hands; and in the course of time even the good workman may become desperate.

In the dull time of 1914 it is reported that in Boston men committed petty crimes in order that they might be sent to the workhouse. Then they were sure of their keep while their wives might draw from the city 50 cents a day. In 21 cities burglaries increased 30 per cent over the number in 1912, vagrancy 51 per cent, robberies 61 per cent, and mendicants 105 per cent. The divorce and suicide rates also increased.

Cumulative effects of unemployment.[26]—Unemployment results in lowering the quality of the workers. The worse fed are the children of the unemployed, the less will they earn when they eventually engage in some occupation themselves, and the less able will they be in turn to provide for the needs of their children, and so on. Again, the less trained they are the less will they realize the importance of giving their children a good training and the less able will they be to provide adequately for so doing. These evils are cumulative. Another group of evils and deep influences which are produced by unemployment result from its effect on trade unions. Periods of unemployment constitute a menace to trade unions; they result in a lowering of membership, a drain on the funds, and a weakening of their morale. Their

[26] Adapted with permission from Joseph L. Cohen, *Insurance against Unemployment,* pp. 35–36, 38–39. (P. S. King & Son, Ltd., 1921.)

power to bargain effectively is thus lessened. This disadvantage is cumulative in two ways: It lowers workmen's wages; this lowers their efficiency as workers and consequently the normal value of their labour. And in addition it diminishes their efficiency as bargainers still more, and thus makes it more likely that they will sell their labour for even less than the employer could afford to pay them.



WHERE THE "STANDARD BILL" PROVIDES OLD-AGE PENSIONS

Six states, Montana and Nevada (in 1923), Wisconsin (1925), Kentucky (1926), Colorado and Maryland (1927), and the territory of Alaska, have already adopted straight old-age pension laws, based on the "standard bill." The "standard bill" is a very modest proposal that a citizen of seventy years or upward who has also resided continuously fifteen years in the state, shall, if the value of the applicant's property does not exceed \$3,000, be entitled to a pension which when added to other income shall not exceed a total of \$1.00 a day. A state-county system of administration is provided on an economical basis with provision for careful local investigation and general supervision.

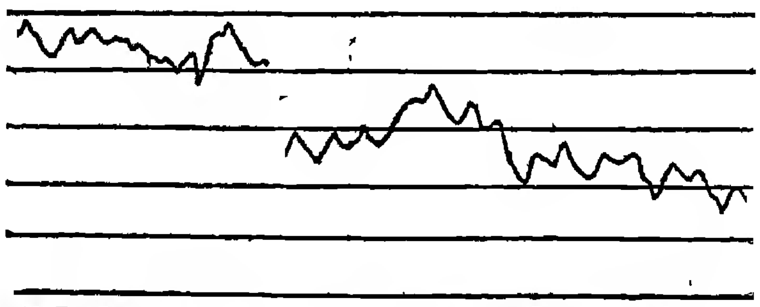
F. IS THERE TECHNOLOGICAL UNEMPLOYMENT TODAY?[27]

Between 1920 and 1927, factory employment in the United States decreased by approximately 10 per cent, and railroad employment by nearly 15 per cent. During the first nine months of 1928, factory and railroad forces have been smaller than in the corresponding period of 1927. In mining there has been no appreciable change since 1920, but in agriculture there was a drop of approximately 900,000 between 1920 and 1925, and it is probable that there has been an additional drop of over 400,000 between 1925 and 1928. The total shrinkage of employment in these four major branches of industry between 1920 and 1927 has probably been about 2,300,000.

During the last eight years there have been substantial increases of employment—no one knows precisely how large—in the profes-

[27] Adapted from Sumner H. Slichter, "Market Shifts, Price Movements, and Employment," *American Economic Review Supplement*, XIX, No. 1 (March, 1929), 5–22.

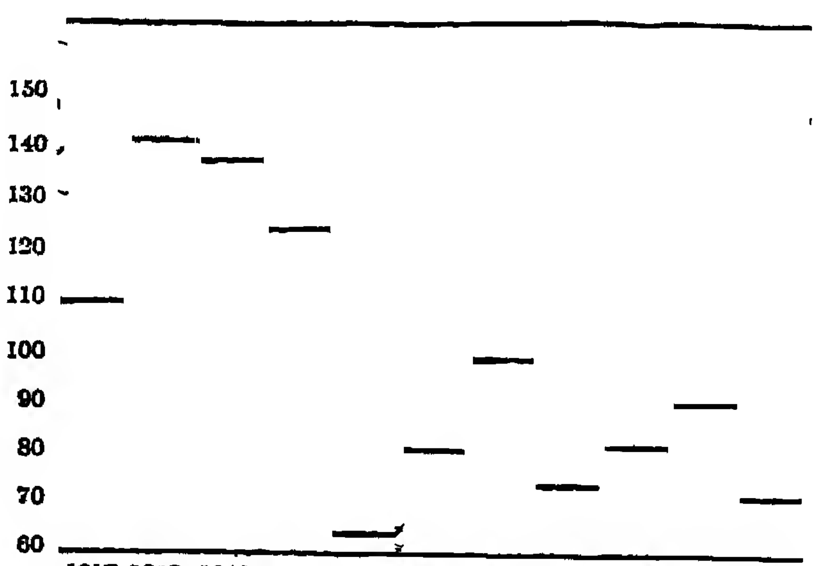
sions, the building trades, public utilities, hotels, clerical work, highway transportation, the distributive occupations, the repair trades, some forms of personal service, and bootlegging. These increases have



1919-Base

A New Low Level of Employment

The above chart, prepared by the American Association for Labor Legislation from official New York State statistics, shows the trend of factory employment in New York City from 1917 to the beginning of 1928. It shows a new low level of employment in 1927, lower even than that of the depression year of 1921, with indication of a still further decline.



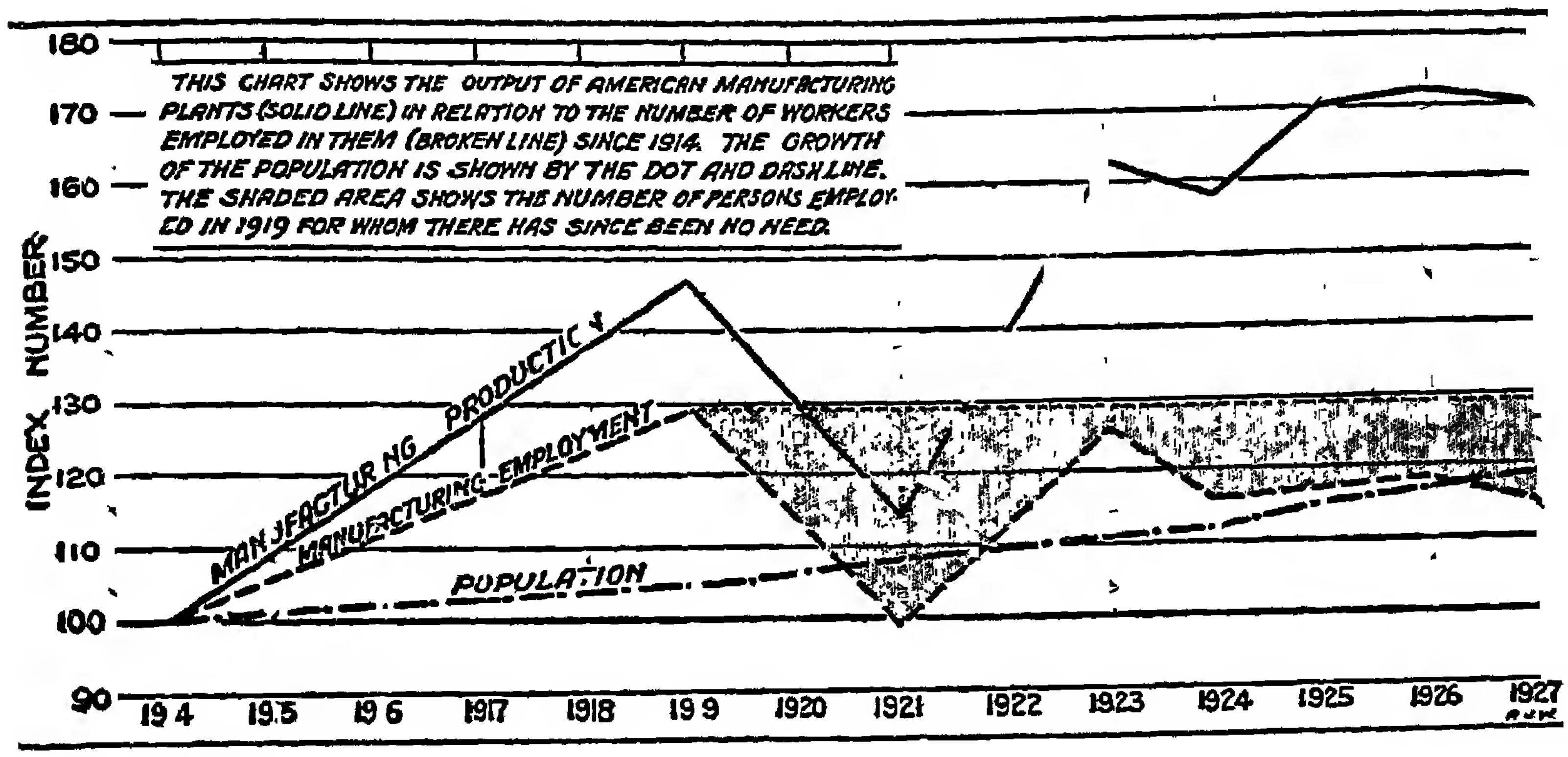
1923-Base

An Index to Local Demand for Workers

The above chart, prepared by the American Association for Labor Legislation from a study of Help Wanted advertisements in the *New York World* from 1917 to 1928, shows that the demand by employers for help has fallen off to a point nearly as low as the low point in the severe depression of 1921. Help Wanted ads are a significant gauge of local employment conditions, particularly since they include demands for domestic and clerical, or "white collar" workers, in addition to factory employees.

probably exceeded the drop in manufacturing, railroading, and farming. Between 1920 and 1928, however, the population of the country increased by about 13,600,000. These facts indicate that it is at least probable that unemployment during the last year has been greater than at any time since 1924 and possibly greater than at any time since 1922. Some estimates place the increase between 1923 and the

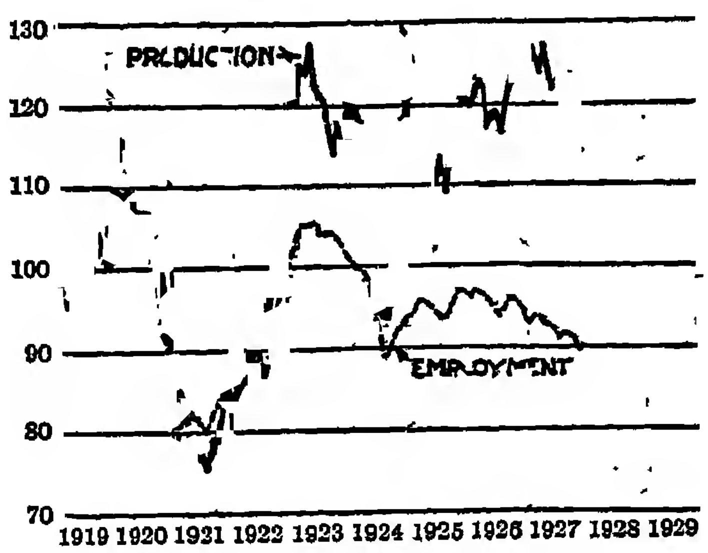
beginning of 1928 as high as 3,000,000; others as low as 700,000. It is a striking commentary upon the state of our information that such serious disagreement can exist.



New York Times

Industry Is Producing More Goods with Fewer Workers

The above chart, from an article in the *New York Times* entitled "March of the Machine Makes Idle Hands" by Evans Clark, graphically indicates the new "technological" unemployment said to be due to the increasing introduction of labor-saving methods and machinery.



Courtesy National City Bank

The Widening Gap between Production and Employment

The above chart showing the trend of production and of employment from official figures of the Federal Reserve Board strikingly reveals the "new" unemployment with production of goods increasing and the number of workers employed decreasing.

The recent shrinkage in factory, railroad, and agricultural employment has not been caused by a drop in production. On the contrary, it has occurred despite a substantial expansion of physical out-

put. In this respect it differs from the more familiar contractions in employment which accompany seasonal and cyclical slumps.

The rapid growth of physical output per man has been eagerly seized upon as an explanation for the displacement of labor. But although greater output per worker is important in explaining the tendency of employment in farming, manufacturing, railroading, and mining to shrink or to remain stationary, it is not in itself *the* explanation. The industries in which the effectiveness of labor has grown most rapidly are not necessarily those in which employment has diminished, and many important decreases in factory employment appear to be attributable to causes other than greater output per worker.

If one examines the industries in which employment has diminished most, it will be found that, as a rule, they are ones which have suffered from rapid and even sudden contraction of their markets.

My explanation of the falling or stationary employment in farming, manufacturing, railroading, and mining falls into two parts. The first is the reluctance of the public to increase its expenditures for the products of these branches of industry. The decreasing outlay for the products of farms, factories, railroads, and mines enables us to understand the relationship between the growing effectiveness of labor and the shrinkage of employment in these industries. Employment has diminished or has remained stationary, not simply because labor has become more productive but because its growing effectiveness has been coupled with a pronounced reluctance on the part of the public to spend more for agricultural products, manufactured goods, minerals, and railroad service.

The second part of my explanation of the shrinkage or stationary employment in farming, manufacturing, railroading, and mining is to be found in the movements of (1) wages, (2) the prices of producers' goods, and (3) long-time interest rates. All of these prices have fallen since 1920, but the relatively greater drop of producers' goods and interest rates has made it profitable for employers to shift to a combination of productive factors which involves the use of more capital and of less labor.

5. HOURS OF WORK[28]

I. The Dangers of Long Hours
- A. Bad Effects of Long Hours on Health
  - 1. Relation of fatigue to disease
    - *a*) General predisposition to disease
    - *b*) Fatigue and infectious diseases
    - *c*) Fatigue and nervous diseases
      - (1) Nervous diseases and statistics of foreign sickness insurance societies
      - (2) Ages of incidence
      - (3) Nervous diseases and heredity
      - (4) Nervous diseases and overstimulation
    - *d*) General injuries to health
    - *e*) Injuries to eyes and ears
    - *f*) Injuries to other organs or parts of the body
- B. Health-Hazards in Modern Industry
  - 1. The new strain of manufacture
    - *a*) Speed
    - *b*) Monotony
    - *c*) Piece-work
  - 2. Injurious physical surroundings
    - *a*) Bad air, humidity, extremes of temperature, noise, etc.
    - *b*) Exposure to dust, gases, fumes, poisons, etc.
- C. The Nature and Effects of Fatigue
  - 1. The chemical nature of fatigue
  - 2. The toxin of fatigue
  - 3. Muscular fatigue
  - 4. The greater strain on fatigued muscles
  - 5. Nervous fatigue
  - 6. The physiological function of rest
    - *a*) Rest needed to repair expenditure of energy
- D. Bad Effect of Long Hours on Safety
  - 1. Incidence of accidents
  - 2. Fatigue of attention
- E. Bad Effects of Long Hours upon Morals
  - 1. General loss of moral restraints
  - 2. Growth of intemperance
- F. Bad Effects of Long Hours on General Welfare
  - 1. State's need of preserving health
  - 2. Injuries to family life and the community

[28] Adapted by permission from Felix Frankfurter and Josephine Goldmark, *The Case for the Shorter Work Day*, I, iii–v. (Reprinted by National Consumers' League.)

II. Benefits of Short Hours
- A. Good Effect on Morals: Growth of Temperance
- B. Good Effect on General Welfare
  - 1. General benefit to society
  - 2. Benefit to leisure and recreation
    - *a*) The experience of Australasia
- C. Benefit to Citizenship
  - 1. Preparedness:
    - *a*) Political: the citizen as voter
    - *b*) Social: Americanization of the foreign-born
    - *c*) Military: the citizen as soldier

III. Economic Aspect of Reducing Hours
- A. General Benefit to Commercial Prosperity
- B. Effect on Production
  - 1. Superior output in shorter hours
    - *a*) Some recent instances
    - *b*) Textile trades: cotton, wool, linen, jute
    - *c*) Metal trades: iron and steel, tin plate
    - *d*) Mines and quarries: coal, slate, etc.
    - *e*) Granite and stone cutting
    - *f*) Glass and optical instruments
    - *g*) Chemicals
    - *h*) Cigars
    - *i*) Shoes
    - *j*) Miscellaneous instances
    - *k*) General comments
  - 2. Shorter hours increase efficiency on the part of the workers
  - 3. Shorter hours lead to improvement in management
  - 4. Relation of short hours to cost of production
  - 5. Long hours reduce efficiency and result in inferior output
- C. Relation to Wages
- D. Relation to Regularity of Employment

IV. Uniformity of Restriction Needed for Justice to Competing Employers

6. DISADVANTAGES CONNECTED WITH FREEDOM OF CONTRACT[29]

[Note.—Although some of the specific items in the following have been lightened by later laws and interpretations, the general impression left by the selection is trustworthy.]

[29] Taken by permission from John Dewey and J. H. Tufts, *Ethics*, pp. 505–6, note. (Henry Holt & Co., 1910.)

The list appended was bulletined at the Chicago Industrial Exhibit of 1906 and reprinted in *Charities and the Commons*.

What "Freedom of Contract" has meant to Labor:

1. Denial of eight-hour law for women in Illinois.

2. Denial of eight-hour law for city labor or for mechanics and ordinary laborers.

3. Denial of ten-hour law for bakers.

4. Inability to prohibit tenement labor.

5. Inability to prevent by law employer from requiring employee, as condition of securing work, to assume all risk from injury while at work.

6. Inability to prohibit employer selling goods to employees at greater profit than to non-employees.

7. Inability to prohibit mine owners screening coal which is mined by weight before crediting same to employees as basis of wage.

8. Inability to legislate against employer using coercion to prevent employee becoming a member of a labor union.

9. Inability to restrict employer in making deductions from wages of employees.

10. Inability to compel by law payment of wages at regular intervals.

11. Inability to provide by law that laborers on public works shall be paid prevailing rate of wages.

12. Inability to compel by law payment of extra compensation for overtime.

13. Inability to prevent by law employer from holding back part of wages.

14. Inability to compel payment of wages in cash; so that employer may pay in truck or scrip not redeemable in lawful money.

15. Inability to forbid alien labor on municipal contracts.

16. Inability to secure by law union label on city printing.

Labor representatives speak of "the ironic manner in which the courts guarantee to the workers: The right to be maimed and killed without liability to the employer; the right to be discharged for belonging to a union; the right to work as many hours as employers please and under any considerations which they may impose." The "irony" is, of course, not intended by the courts. It is the irony in-

herent in a situation when rules designed to secure justice become futile if not a positive cause of injustice, because of changed conditions.

C. Position of the Worker as a Producer: Remedial Action by Worker and Community

The fears and insecurities sketched in the preceding section have of course led to much activity of a remedial nature. The workers themselves, being vitally interested, have developed certain attitudes toward their participation in production and have also developed certain institutions (especially the union) for use in the struggle in which they find themselves. The employers have taken coresponding action, partly in opposition to the demands of labor, and partly in the direction of increasing the security of the workers. And society at large, moved partly by a consciousness of the significance of the issue for general social welfare and partly by the insistence of the interested parties, is also taking action. All these attitudes and activities profoundly affect productivity.

We shall do well, at this stage of our study (some of the issues will arise again later), to keep our minds open and refrain from passing final judgment upon the attitudes, activities, and institutions which we are now to survey. Our present task is to see the situation, appraise the causes, and take cognizance of the structures arising in our society to meet the needs of the case. In particular our present task looks toward understanding the effects of all these matters upon productivity in our gain ordered society.

In this section it is especially important to direct one's consideration of the readings toward certain[29a] fundamental issues:

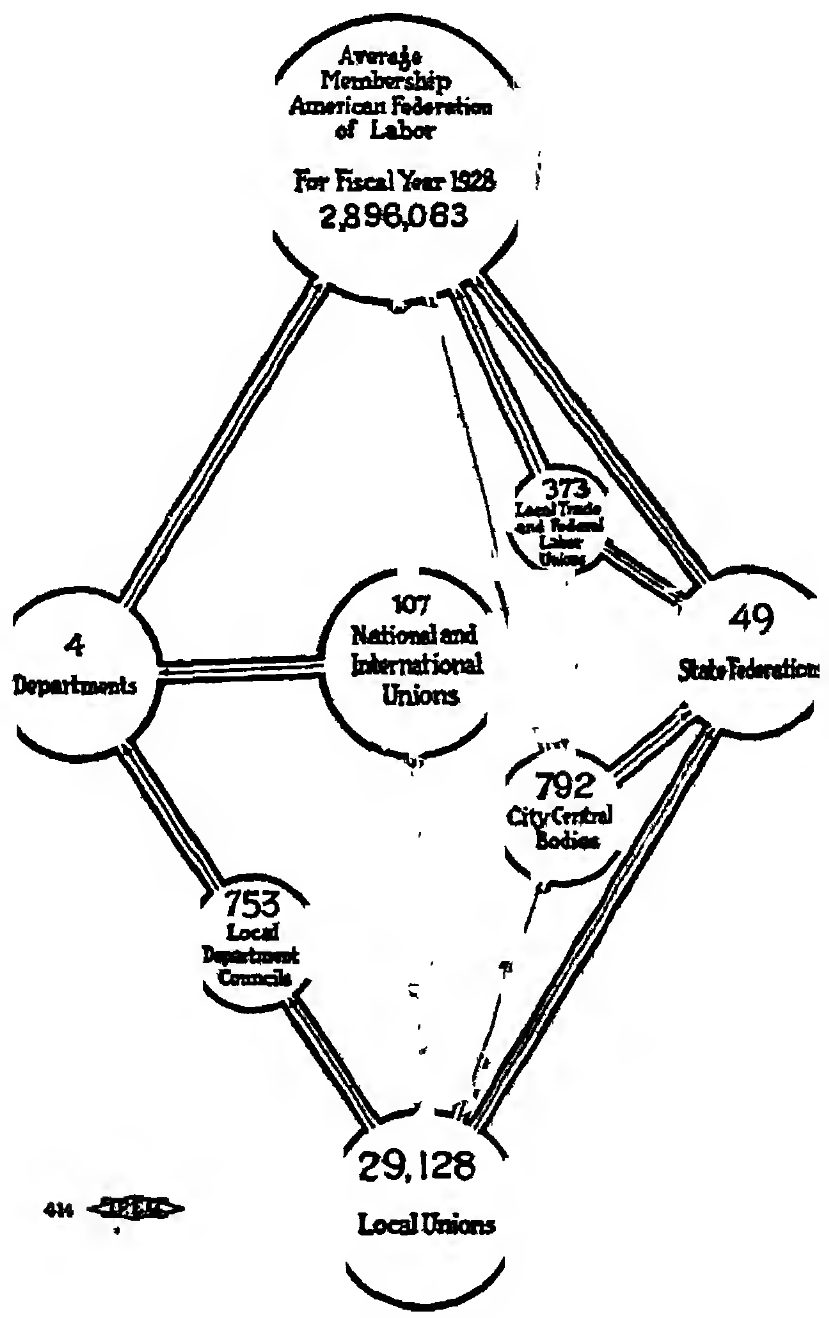
1. In what respects do the union activities of workers seem pointed toward greater productivity, and in what respects do they seem pointed toward lessened productivity?
2. Do "the principle of uniformity" and "the standard rate" tend toward greater or smaller productivity under the conditions of a work-contract-wage-system?
3. In what particulars is "society" moving toward a diminution of the fears and insecurities of the worker? Wherein may such actions be expected to promote productivity?

[29a] A more detailed statement of issues may be found in *Outlines of the Economic Order*, pp. 131–36. (The University of Chicago Press.)

4. Why is the "social minimum" especially important in a society which relies upon individual initiative?
5. As regards labor, what are the chief elements or features of a desirable social minimum?

1. LABOR UNION STRUCTURAL TYPES[30]

1. *The craft union.*—A craft union in its pure form consists of persons following a particular calling or occupation, possessing in



Organization Chart of the American Federation of Labor

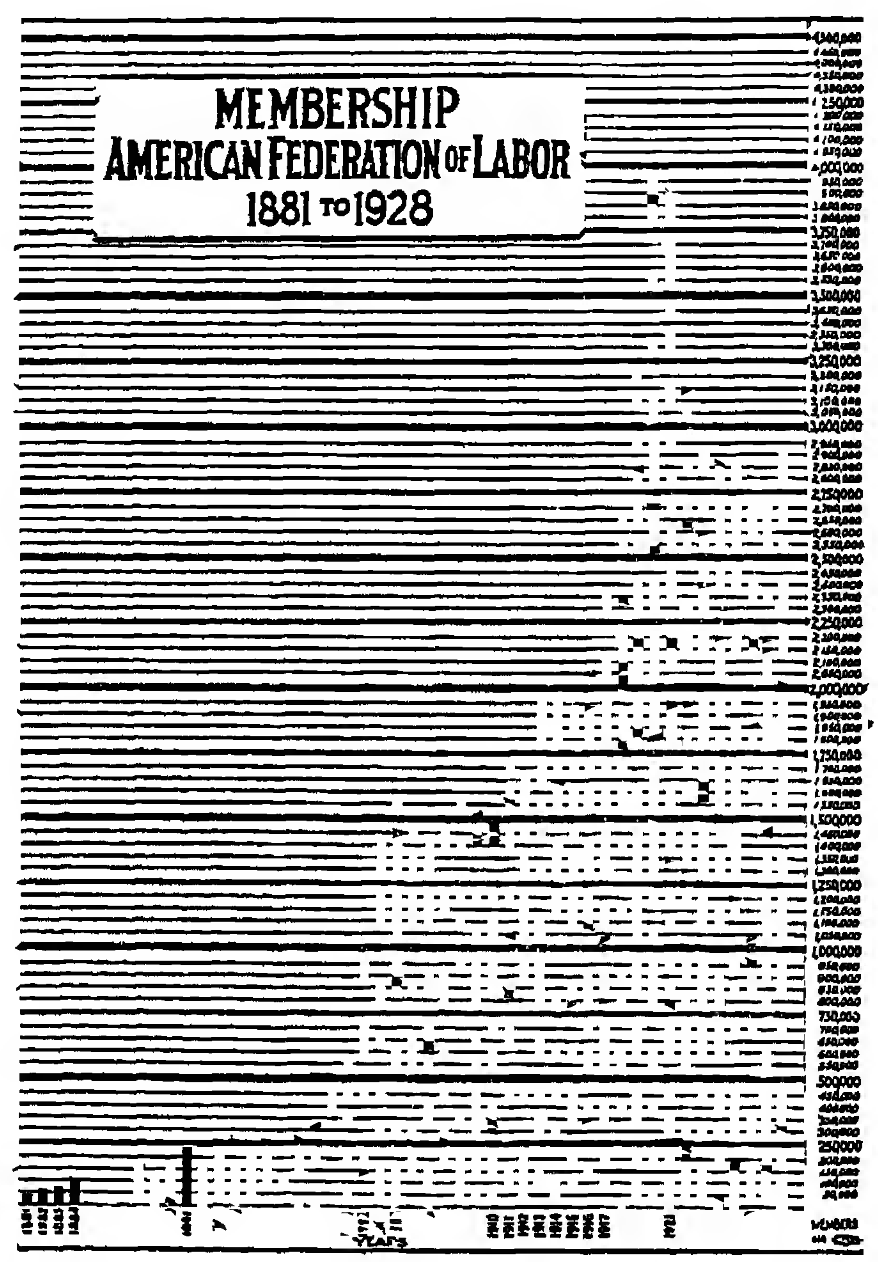
(Taken from the *Report of the Executive Council of the American Federation of Labor to the Forty-eighth Annual Convention* [1928], p. 8.)

common a certain skill, and aiming in common at a certain set of conditions of employment. Often, however, the craft union form does not

[30] Adapted by permission from G. D. H. Cole, *An Introduction to Trade Unionism*, pp. 13–18, as quoted in Douglas Hitchcock, and Atkins, *The Worker in Modern Economic Society*. (Trade Union Series, No. 4. Published by the Labour Research Department, 25 Tothill St., Westminster; and by George Allen and Unwin, Ltd., 20 Museum St., London, W.C.)

appear in such purity as this, and we find associated in a single union a number of kindred grades. This is the case, for instance, with the boiler-makers, who include angle-iron smiths, platers, caukers, rivetters, and various other sections.

2. Akin to the craft basis of organisation is a basis of organisation which it is not easy to define. I will call it for the moment *material trade unionism.* This form of organisation follows the line not of the precise craft followed by the worker concerned, but of the material on which he may happen to be working, and it is interesting to note that this is actually the form of organisation adopted by the largest trade union in Germany—the German Metal-Workers' Union.



THE GROWTH OF THE AMERICAN FEDERATION OF LABOR

3. Broadly contrasted with craft unionism in all its various forms is *union by industry,* which again may assume a number of different forms. Advocates of union by industry, broadly speaking, set out to combine in a single union all those workers who co-operate in producing a common product or type of product, or in rendering a common

service, irrespective of the degree of skill which they happen to possess. Thus they aim at creating one union for the railway industry, one union for the mining industry, one union for the building industry, and so on. This form of organisation, however, passes over easily into a form of organisation which aims at copying exactly the present capitalist structure of industry and at grouping in a single union all those persons who work under a common employer or group of employers.

4. A further type of union is that which follows the line of sex.

5. There is one further type of union which it is only necessary to mention in order to dismiss it with a word. This is the type which endeavours to include in a single organisation all workers irrespective of trade, craft, industry, sex, or any other consideration, on the basis merely of their own status within the capitalist system. Of this type is the organisation known as the Industrial Workers of the World.

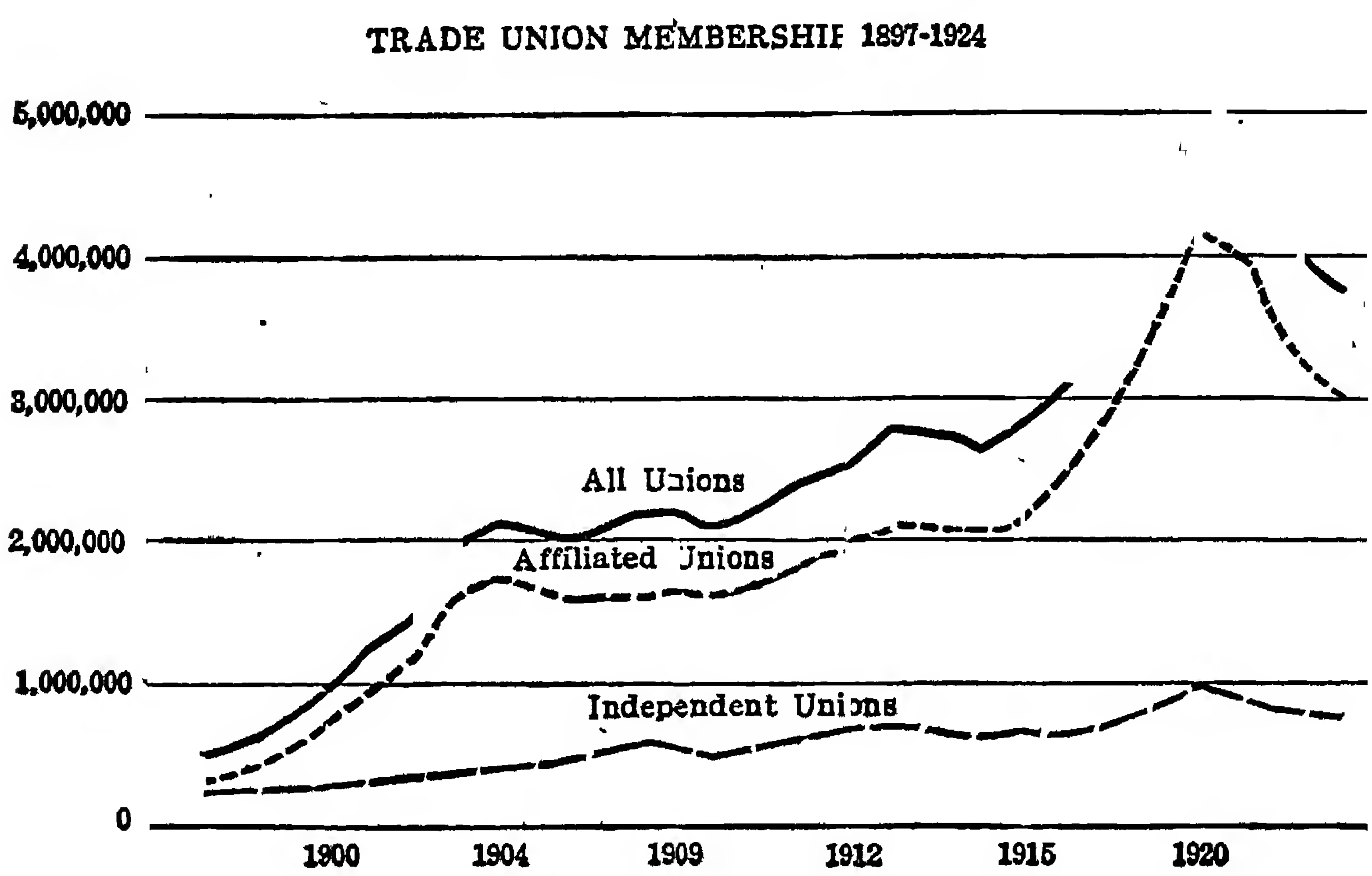
2. LABOR UNION FUNCTIONAL TYPES[31]

There are seemingly four distinct types, two of which present dual variations.

The first and perhaps most clearly recognizable functional type may be termed *business unionism.* Business unionism appears most characteristically in the programs of local and national craft and compound craft organizations. It is essentially trade-conscious rather than class-conscious. That is to say, it expresses the viewpoint and interests of the workers in a craft or industry rather than those of the working class as a whole. It aims chiefly at more here and now for the organized workers of the craft or industry, in terms mainly of higher wages, shorter hours, and better working conditions, regardless for the most part of the welfare of the workers outside the particular organic group, and regardless in general of political and social considerations except in so far as these bear directly upon its own economic ends. It regards unionism mainly as a bargaining institution and seeks its ends chiefly through collective bargaining supported by such methods as experience from time to time indicates to be effective in sustaining and increasing its bargaining power. Thus it is likely to be

[31] Adapted by permission from Robert F. Hoxie, "Trade-Unionism in the United States: General Character and Types," *Journal of Political Economy,* XXII (1914), 211–16.

exclusive, that is, to limit its membership by means of the apprenticeship system and high initiation fees and dues, to the more skilled workers in the craft or industry or even to a portion of these. In method, business unionism is prevailingly temperate and economic. It favors voluntary arbitration, deprecates strikes, and avoids political action, but it will refuse arbitration and resort to strikes and poli-



THE TREND OF UNIONISM IN THE UNITED STATES, 1897–1923

(Taken from Wolman, *The Growth of American Trade Unionism*, p. 63.) "Affiliated union" means affiliated with the American Federation of Labor.

tics when such action seems best calculated to support its bargaining efforts and increase its bargaining power. This type of unionism is perhaps best represented in the programs of the railway brotherhoods.

The second union functional type seems best designated by the terms *friendly or uplift unionism.* Uplift unionism, as its name indicates, is characteristically idealistic in its viewpoint. It may be trade-conscious or broadly class-conscious, and at times even claims to think and act in the interest of society as a whole. Essentially it is conservative and law-abiding. It aspires chiefly to elevate the moral, intellectual, and social life of the worker, to improve the conditions under which he works, to raise his material standards of living, give him a

sense of personal worth and dignity, secure for him the leisure for culture, and insure him and his family against the loss of a decent livelihood by reason of unemployment, accident, disease, or old age. In method, this type of unionism employs collective bargaining but stresses mutual insurance, and drifts easily into political action and the advocacy of co-operative enterprises, profit-sharing, and other idealistic plans for social regeneration. The nearest approach in practice to uplift unionism is perhaps to be found in the program of the Knights of Labor.

As a third distinct functional type, we have what most appropriately may be called *revolutionary unionism*. It is distinctly class-conscious rather than trade-conscious. It repudiates, or tends to repudiate, the existing institutional order and especially individual ownership of productive means, and the wage system. It looks upon the prevailing codes of right and rights, moral and legal, as in general fabrications of the employing class designed to secure the subjection and to further the exploitation of the workers. In government it aspires to be democratic, striving to make literal application of the phrase *vox populi, vox Dei*.

Of this revolutionary type of unionism there are apparently two distinct varieties. The first finds its ultimate ideal in the socialistic state and its ultimate means in invoking class political action. The second variety repudiates altogether socialism, political action, collective bargaining, and contract. It looks forward to a society based upon free industrial association, and finds its legitimate means in agitation rather than in methods which look to immediate betterment. Direct action and sabotage are its accredited weapons, and violence its habitual resort. These varieties of the revolutionary type may be termed respectively socialistic and quasi-anarchistic unionism. The former is perhaps most nearly represented in the United States by the Western Federation of Miners, the latter by the Industrial Workers of the World.

Finally in the union complex it seems possible to distinguish a mode of action sufficiently definite in its character and genesis to warrant the designation *predatory unionism*. This type, if it be truly such, cannot be set apart on the basis of any ultimate social ideals or